REPORT

ON THE

EPIZOOTIC DISEASES OF CATTLE

IN

LOWER BENGAL,

BY

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REPORT ON THE EPIZOOTIC DISEASES OF CATTLE IN LOWER BENGAL.

I.—History.

The earliest notice which I have found of Epizootic Diseases among cattle in Lower Bengal is by H. Piddington, Esquire,(1) whose communication is dated 13th July 1836. He calls the disease *Bosonto;* surmises that it is a species of contagious dysentery; states that his own cattle were attacked three or four times in the course of seven or eight years; gives a slight sketch of the symptoms, and details a method of treatment which he recommends with confidence.

(1) XXVI

He further states that in the Campaign of Ava this disease was so severe among the Commissariat cattle that it interfered with the advance of the Army. This removes the disease about twelve years back.* Mr. Piddington talks of "the Bosonto which attacks the cattle of Bengal," as of a well known and general disease. The next notice of cattle disease, on a large scale which I have been able to obtain, is of an epizootic in Ceylon in 1842.(2)

(2) XXVIII. 2.

The disease in this case is not named; but the notes of it are very interesting, and will be alluded to in the sequel.

In the year 1853 cattle disease was very prevalent and fatal in Assam.(3) It has continued to rage at intervals in the various districts of that Division.

(3) XXIX.

In 1861 an eruptive disease of an epizootic character affected the municipality cattle of Calcutta so severely that a Veterinary Surgeon was appointed to investigate its nature and treatment.(4)

(4) X.

In 1863 the attention of the Madras Government was called by Captain Nelson to a very general and fatal eruptive epizootic which had carried off hundreds of cattle.

The Government of Bengal was addressed on the subject,(5) and a Circular calling for information (No. 5331, dated 20th November 1863) was addressed to all the Commissioners of the Divisions of Bengal. This Circular elicited a number of interesting and important reports.(6)

(5) I. 12.

(6) II—IX.

These reports, which were published in a supplement to the *Calcutta Gazette* of 12th March 1864, and included information from nearly every district in Bengal Proper, render it evident that cattle diseases of an epizootic character have periodically raged throughout the Province from a time beyond recollection. In the absence of any attention having been directed to the subject, or of any records, it is impossible now to fix the time of their origin or to trace their progress; but there is every reason to believe that most, if not all, of them are of indigenous growth, and have existed as long as there have been cattle to be affected or conditions of climate and soil resembling the present conditions.†

In January 1864 an exhibition of cattle was held at Alipore, and there cattle disease of a virulent and fatal type broke out and raged for three months. This still further aroused the attention of Government, and Dr. C. Palmer was appointed to draw up a special report on the subject. After making the necessary inquiries and investigations, Dr. Palmer presented his able and interesting report(7) in October 1865. This report was printed and circulated throughout Bengal with a Circular calling for further information (No. 3468 of 16th July 1866).

(7) X.

This elicited a second series of report (XII.—XXV.) which contain much interesting matter; they conclusively show that in the various epizootics, which so extensively prevail throughout Bengal, we have a subject of intense interest demanding careful and constant study; that the mortality which occurs among cattle yearly from this cause is a most

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* Dr. McPherson (XXXI. p. 14) alludes to an epizootic disease of cattle in the army in 1817, and Mr. Gudgin, Veterinary Surgeon, ascertained in 1866, by careful enquiry, that cattle diseases have been prevalent in British Burmah for forty or sixty years at intervals (XXXVI. p. 4.)

†There is however, in the fact of the increase of the price of cattle in recent years mentioned by Mr Oliphant (IX.) and others, a reason for thinking that the loss of cattle has been greater in late years than formerly, but that increase may depend upon other causes, and may be but an instance of the general rise of prices which have been steadily advancing during the last 50 years in this country.

The impression, however, that cattle diseases have been more general, virulent, and fatal of late years is a very general one. Mr. Gudgin, Veterinary Surgeon, in his report of cattle diseases in British Burmah, is decidedly of this opinion, which is based upon the testimony of the natives. There can be no doubt of the fact of the increase of price and the greater attention which these diseases have of late attracted.

[redacted] consideration, bearing on the most intimate interests of the people; that methods of providing against the appearance of such epizootics, or cutting them short after they have appeared, or of treating the affected animals are very various and very inefficacious, and that among the natives themselves much superstition and apathy exist on this subject. In the following pages all the information which has been collected on the subject of cattle diseases will be presented in a methodical and digested form. I shall in order treat of—

1*st*.—The varieties of the diseases observed and their names.
2*nd*.—Of their geographical distribution.
3*rd*.—Of their modes of origin and spread.
4*th*.—Of the causation.
5*th*.—Of the symptoms of the principal forms of disease.
6*th*.—Of the *post mortem* appearances.
7*th*.—Of the Pathology.
8*th*.—Of the Diagnosis.
9*th*.—Of the Prognosis and,
10*th*.—Of the treatment, preventive and curative.

Under each of these heads I shall endeavor to indicate what points have been already pretty clearly made out, and what still remain for investigation.

Owing to the action of Government in the matter the attention of officers every where is now constantly directed to the subject, and out-breaks of disease among cattle are watched and reported on with nearly the same care as epidemics of disease among men. Eventually a large mass of important facts will be accumulated which will clear up points now doubtful: but it will greatly assist such a consummation if the facts already collected are presented in a well arranged and reasoned form.

II.—Varieties and Names.

Owing to several causes, among them principally the want of any uniform veterinary nosology, the non-professional character of the reporters, the partial descriptions of symptoms, and the varieties of dialect in different districts, it is not an easy matter to determine what different names apply to the same disease in different districts, or in some cases what precise disease is meant and expressed by a particular name.

The varieties of diseases enumerated in the various reports, however, come under one of the following heads.

A. Epizootic Diseases.
   1. Eruptive.
   2. Not eruptive.
B. Non-Epizootic Diseases.
   1. General.
   2. Local.

It is to the diseases which are included under the former head that attention has hitherto been mainly directed. Those coming under the second head, though disguised under a variety of fanciful names, are well known, and their nature and treatment is definitely laid down in veterinary works. They are mostly local affections, produced by strictly local causes, connected with the immediate conditions of life of the animal and most of them amenable to simple modes of treatment.

A.—Of the epizootic class of diseases, those accompanied by an eruption occupy a more prominent position in the official papers than those without an eruption.

Of these diseases two varieties at least can be distinguished. They are perhaps different degrees of the same disease, but their severity and mortality are so distinct that for practical purposes it is well to separate them.

1*a*. The first is the "foot and mouth disease" of English veterinary medicine.

It is known in different districts by various names, most of them derived from *khoor*, a hoof. It is called *Khoorea* (Rajshahye)(1) *Khoraha or Khang* (Shahabad)(2) *Zairkhara* (Tirhoot) *Khurpakka* (Buxar) *Khoratte* (Darjeeling)(3) *Khorah* (Lohardugga)(4) *Homsa* (Midnapore)(5) *Sob ka* (Durrung)(6) and *Khorahtile* (Jessore). It is probable that besides the epizootic disease of the mouth and foot called eczema epizootica, any diseased conditon of the hoot will be included under these terms. Cattle in India frequently suffer from strictly local affections of the hoof caused by foreign bodies, wet, &c., corresponding to the English "foul in the foot" which ought carefully to be distinguished from the epizootic disease.

(1) VI.
(2) XV.
(3) XVIII. 1.
(4) XXIII. 1.
(5) IV. 1.
(6) XXXV. 3.

b. By far the most important disease of this group is the more serious affection known by the various names of *Gootee*, *Boshonto*, *Mata*, *chechack*, (Bhaugulpore and Sarun)(7) *Sitala*, *Mardrishti* (Jessore)(8) *Takrooni* (Jessore and Rajshahye)(9) and *Markhee* (Dooars).(10) It isalso alluded to as "the Murrain" "Small-pox" "Cow-pox," and Dr. Palmer(11) believes it to be the Eczema Epizootica of Veterinary Surgeons.

(7) VII. 2. & V.
(8) IX.
(9) VI.
(10) XIV.
(11) X. p 8.

2*a*. Of the epizooties without any eruption the best known and most formidable is the disease most commonly known as *Puschima*. This disease is thought to be the same as the "*Rinderpest*" of Russia and Dr Palmer(1) believes the "Calcutta epizootic" to have been a manifestation of this plague. It is somewhat difficult from the variety of names and imperfect descriptions to determine what terms are used to designate this disease in different Districts. The term *Puschima* is known throughout the Divisions of Nuddea and Burdwan. The words *rog* and *nava* are sometimes appended to the term. In the Patna Division the same disease appears to go under the name of *Dukuha*, (Patna,)(2) *Hengaha* (Shahabad) and *Waghah* (Tirhoot). In Darjeeling this disease is called "*Dosalin*" or "the plague."(3) It is also known by the names of *jor or jorun*. *Burrapera* (the great sickness) *Hureena* (Gurbettah)(4) *Hurna* (Bhaugulpore (5) (from a Bengalee word signifying mad or rabid, and probably expressive of the uneasy manifestations of an animal laboring under severe disease,) and in many places this disease from the similarity of its symptoms to those of Gootee is called by the same names.

(1) Loccit.
(2) XV.
(3) XVIII.
(4) XVII.
(5) V.

b. Another disease apparently of an epizootic character is ulcerated sore throat or *Golahar*(6) which is not uncommon, and seems to be the same disease as "thrush" or "blain". I observe that the disease has been very prevalent in some parts of Madras during the past season.*

(6) VI. and XVII.

c. Some reports and names seem to indicate that cattle are subject to malarious fever. Of this nature the "*Peela rog* and *Badul-khor* of Beerbhoom(7) and the *Budla* of Dinagepore(8 seem to be.

(7) XVII.
(8) VI.

d. Cattle would also seem to be subject to Diarrhœa and Dysentery, as distinct affections and not merely symptoms or sequels of other diseases.

The information on these last heads is defective and the subject demands further investigation.

B. It is exceeding difficult from the fanciful and various names, probably suggested by some particular symptom or manifestation, to determine what particular non epizootic disease is expressed by any of the very numerous terms (not far from 100) used by Goallas. In order to arrive at any useful or definite result, it would be necessary for the same person to make a searching investigation into the matter throughout the different districts of the province.

Some well marked diseases are however easily recognised. "Tympanitis "hoven" or "blown" is known by the terms *Foolbagha*(9) and *Tepamina*(10). Rheumatism is expressed by "*Rossbat*"(11) Ring worm by "*Daad*"(11) Palsy by *Battussia*(11). Consumption or rather tuberculous disease of the organs of the nutrition by *Sookmina*(11).

(9) XVII.
(10) VI.
(11) VI.

More than these I have not been able to identify, and very much remains to be done in defining and reconciling the nosologies of different districts, which I suspect are very vague and various. In the succeeding remarks I shall confine myself entirely to the epizootic diseases.

III.—Geographical Distribution.

This will best appear from the accompanying table which I have prepared from the reports submitted to Government from the various divisions of Bengal. It shews that epizootic diseases of cattle are universal throughout the Province. The "foot and mouth disease" is reported to be prevalent in the districts of Shahabad(12), Tirhoot(13), Rajshahye(14), 24-Pergunnahs(15), Jessore(16), Cuttack(17), Hazareebaugh(18), Lohardugga(19), and Midnapore(20). This list is probably far from representing the actual prevalence of this epizootic, but it sufficiently demonstrates how wide an area it effects.

(12) XV.
(13) XV.
(14) VI.
(15) X.
(16) XXV.
(17) XXII.
(18) XXIII. 3.
(19) XXIII. 1.
(20) IV. 1.

The disease usually known by the name of Gootee may be said to be universal throughout Bengal. It is prominently alluded to in every one of the reports under analysis.

The epizootic known by the name of Puschima is most decidedly spoken of, and described in the Districts of Nuddea, 24-Pergunnahs, Jessore, Burdwan, Hooghly, and Howrah, but under other names the disease appears to prevail in Patna, Sarun, Rajshahye, Rungpore, Bograh, Midnapore, Pooree, Nowgong, and Dajeeling.

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* I have assumed the term to apply to internal ulcerations of the throat, but it is possible that external ulcers are meant. In that case, as will appear in the sequel, an occasional condition in the disease called gootee has been constituted a separate disease.

Table shewing the Geographical Distribution of Epizootic diseases of Cattle in Bengal Proper.

Divisions.	District.	Prevalence of Epizootics.		Remarks on the kind of disease, &c.
		Prior to 1864.	To the beginning of 1867.	
I.—Patna Division ...	Patna	Not prevalent to any extent ...	Prevailed severely in 1864-65, a few cases in 1866.	Gootee; and "Dukuha" probably puschima; and foot and mouth disease.
	Sarun	Frequently prevail ...	Prevail in some parts of the District ..	Gootee. Pustules appear slightly and occasionally and "Waghah" (Puschima ?)
	Behar	Known for six or seven years ...	None since 1864 ...	Gootee: pustules all over the body.
	Shahabad	No disease observed ...	Known throughout the District ...	Foot and mouth disease, Gootee, Hengaha, (Puschima ?) and others.
	Chumparun	Prevailed since 1862 ...	None since 1864 ...	Apparently variola. Pustules, becoming confluent, described by Civil Assistant Surgeon.
	Tirhoot	No disease observed ...	Epizootics known ...	Foot and mouth disease, and Gootee.
II.—Bhaugulpore Division ...	Bhaugulpore	Prevail to a slight extent ...	Large numbers of cattle died in 1864; since then mortality has been slight ...	Gootee called "Hurna" ... A similar disease is known
	Monghyr	Ditto ditto ...		Ditto ditto ... in the Sonthal Pergunnahs.
	Purneah	Ditto ditto ...		Ditto called "Agia" ...
III.—Rajshahye Division	Rajshahye	Prevailed in 1856 ...	None since 1864 ...	Gootee, foot and mouth disease, and others.
	Pubna	No disease reported ...	Prevailed since 1864 ...	Puschima apparently.
	Rungpore	Prevail annually to a great extent ...	Raged at intervals during 1865 and 1866.	"Small-pox" and Puschima.
	Bograh	No disease reported ...	Prevailed in May 1866 ...	Puschima apparently.
	Dinagepore	Prevail annually to a great extent ...	None since 1864 ...	"Small-pox."
	Maldah	Prevail periodically with severity ...	Ditto ...	Gootee; Civil Surgeon describes pustules.
	Moorshedabad	Prevail annually to a great extent ...	Ditto ...	"Small-pox."
V.—Dacca Division ...	Dacca	No reports	No disease reported.	
	Furreedpore		Ditto.	
	Sylhet		Ditto.	
	Mymensing		Ditto.	
	Backergunge		Very prevalent and fatal during 1866	"Gootee;" Civil Surgeon calls it "a species of severe fever."
V.—Chittagong Division	Chittagong	No disease observed ...	None since 1864 ...	"Gootee."
	Tipperah ...	Prevalent for many years ..	Severe epizootic in 1865 ...	Called "Mata" by Natives; no eruption observed by Civil Surgeon.
	Noakolly	Frequently appear ...	None since 1864 ...	"Gootee."
VI.—Nuddea Division ...	Nuddea	Frequently appear ...	Ditto ...	Gootee and Puschima.
	24-Pergunnahs	Frequently prevalent ...	Very prevalent and fatal in 1865 ...	Gootee, Puschima, and foot and mouth disease.
	Jessore	Prevail frequently and virulently ...	Ditto ditto ...	Ditto ditto ditto.

VII.—Burdwan Division.	Burdwan	Been known for 20 or 30 years ...	None since 1864 ...	"Gootee" and Puschima.
	Hooghly	Prevail extensively ...	Prevail annually ...	Ditto ditto.
	Howrah	Break out every 3 or 4 years ...	None since 1864 ...	Ditto ditto.
	Bancoorah	Were virulent in 1860 ...	Ditto ditto ...	"Gootee."
	Beerbhoom	Appear periodically ...	Prevail during 1865 and 1866 ...	Ditto.
	Midnapore	Very common ...	Prevail periodically ...	"Gootee" and "Aoosa" resembling Puschima, and foot and mouth disease.
VIII.—Cuttack „ ...	Cuttack	Of yearly occurrence ...	Artillery cattle attacked in 1866 ...	Foot and mouth disease and "Gootee."
	Balasore	Prevailed in 1863 ...	None since 1864 ...	"Gootee"
	Pooree	Prevailed in 1864 ...	Ditto ditto ...	Apparently Puschima.
IX.—Chota Nagpore „ ...	Hazareebaugh	Frequently prevail ...	Ditto ditto ...	Foot and mouth disease and "Mata."
	Lohardugga	Common ...	Prevailed in 1865 ...	"Gootee," foot and mouth disease and others.
	Maunbhoom	Very prevalent in 1864 ...	Prevailed in 1865 and 1866 ...	"Gootee;" 22,000 head of cattle lost. .
	Singbhoom	No information ...	Very prevalent in 1866 ...	"A very virulent cow-pox."
	Sumbulpore	No return ...	No return.	
X.—Arracan „ ...	Akyab	No return.		
	Ramree			
	Sandoway			
XI.—Assam „ ...	Gowalparah	Prevailed virulently in 1853 ...	None since 1864 ...	"Gootee."
	Kamroop	Ditto ditto ...		Ditto.
	Nowgong	Prevailed virulently in 1863 ...		Ditto.
	Seebsaugur	Ditto ditto ...		Ditto.
	Durrung	Prevailed during preceding 4 years ...		"Small-pox."
	Debrooghur	Prevailed virulently in 1853 ...		"Gootee."
	Kassiah Hills	Ditto ditto ...	Prevailed in 1865 ...	Ditto.
XII.—	Cachar	No information ...		
	Darjeeling	Ditto.	Prevailed extensively in the end of 1865	Disease called "Dosalin" or Plague. Puschima(?)

The information about other forms of disease is so fragmentary and imperfect, that I shall not discuss them. The subject of the distribution of epizootics from year to year in the Presidency and its Divisions and Districts is well worthy of attention and renewed inquiry.

IV.—Mode of origin and spread of Epizootics.

The information on this head throws itself into the following well established propositions:—

1. During the season when epizootics are apt to prevail, or in places in whose neighbourhood epizootic diseases are prevailing, sporadic cases are prone to occur.

(1) X. p. 1. XVII. para. 7. XIX. paras. 3 and 6.

This is abundantly illustrated in the official Reports.(1) The cases which occur in this way are generally of a mild description.

2. In advance or anticipation of an epizootic sporadic cases are also observed. The best illustration of this is given in the history of the Assam epizootic.(2) Two months before the epizootic actually appeared five cases were reported to have occurred on a farm.

(2) XXIX. p. 292.

3. When the epizootic actually breaks out, first one cow and then several are affected, till it spreads rapidly over the majority of the fold.

(3) X. p. 1. (4) XVIII. 1. (5) XXVIII.

This is the history of the Calcutta epizootic of 1864, as given by Dr. Palmer(3), of the Darjeeling epizootic of 1865(4), and of the Ceylon epizootic of 1842.(5)

4. The cases which occur at the commencement of an epizootic are more virulent and fatal than those which take place towards the end.

(6) XXIX. (7) X. p. 3.

This proposition is beyond dispute, and is illustrated by the Assam epizootic(6) and the Calcutta epizootic.(7)

5. Epizootics break out and prevail principally among herds of cattle. This is insisted on by Dr. Coates,(8) but is subject to the doubt arising from the fact that cattle are almost invariably herded in this country. Besides, the cases of several European gentlemen,(9) whose cattle were not herded in the strict meaning of the term and still suffered severely from prevailing epizootics, show that when the causes of the diseases are very rife, it may attack cattle under any circumstances. Still there can be no doubt of the fact that, as crowds of men are more prone to be attacked by and succumb to epidemic influences(10), so herds of cattle are more apt to be attacked by and suffer from epizootics.*

(8) VII.

(9) X. p. 3. IV. 2. XVI. XXIX.

(10) XXXI. p. 80.

6. After the disappearance of an epizootic, sporadic cases of a mild kind are observed.(11)

(11) X. p. 3.

7. Epizootics have a tendency to periodical return, and in the interval may prevail in a mild or mitigated form. The length of the interval is variously stated, every year,(12) every three or four years,(13) four or five years(14) and every ten or twelve years.(15)

(12) XVII. VI., VII., 3, &c. (13) IV. (14) XIX. Para. 3. (15) XIX. Para. 6.

The prevalence of a mild form of disease in the intervals of severe attack is testified by some observers.(16) While the fact of periodical recurrence is admitted by many.(17)†

(16) II. VIII. 2. XXIII. 4. (17) IV. VI. XXV.

8. Epizootics when they break out generally rage for a definite period, and decline or disappear after the lapse of that time. Three months appears to be the average duration of epizootics in a particular place. The Calcutta epizootic of 1864 prevailed from January to April.(18)

(18) X. p. 3.

A severe epizootic at Nassirnuggur, Tipperah, is stated to have lasted three or four months(19), at Kurnool in Madras, the epizootic is said to have prevailed for three months.(20)

(19) XVI. (20) I. 2.

In other cases, as in the Assam and Backergunge visitations, the disease was more protracted.

The fact of its general prevalence for three months is interesting when compared with the division of the year into period of three months, which Dr. McPherson has found the most convenient and significant arrangement in discussing the relation of cholera to seasons.(21) Besides the theory of the change of season, so altering the endemic influences of a locality as to render the specific influences of the fever poison inoperative, there is another probable explanation of the circumstance, namely, that three months is nearly the average time in which all animals susceptible of the epidemic influence are affected by it.

(21) XXXI., p. 6.

9. In a severe epizootic, while the great majority of cattle are susceptible of the influence and suffer from the disease, a certain proportion, small in proportion to the severity of the type of the disease, escape infection.‡

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* "All the diseases are always more or less prevalent among the great cattle herds of Palamow." (XXIII. 2.)

† Mr. Gudgin, Veterinary Surgeon, in his report of Cattle Disease (Puschima) in British Burmah, remarks. "In some places it makes its appearance year after year, in others at intervals of 8, 5, 10, and 18 years. XXXVI., p. 4.

‡ This law also applies to localities as well as to cattle.

This is very strikingly illustrated by the immunity of two of the Reverend Mr. Higgs's cattle in Assam.(1)

(1) XXIX.

10. In some cases epizootics are preceded or succeeded by an epizootic invasion of a milder form of disease. Foot and mouth disease is reported to have preceded and succeeded "Gootee" in some instances.(2)

(2) XXIII. 1. XXV. XX. XVIII., 1.

11. Occasionally the spread of the epizootic is observed to have a definite direction. In Assam it spread eastward.(3) In Backergunge it is also said to have proceeded eastward(4)*, while in the case of the Jessore epizootic of 1867 which I investigated personally it seemed to pursue a northerly course.(5)

(3) XXIX. (4) XIII. 1. (5) XXV.

12. In many severe epizootics, the origin and spread of epizootics was observed to coincide with the origin and spread of epidemics of fever and cholera among man. This was notably the case in Assam in 1853.(6) This simultaneous occurrence of epizootics and epidemics is a well known fact and is stated as one of the laws of epidemic influence by Dr. Aitken.(7)

(6) XXIX. (7) XXXII. P. 223.

13. Besides cattle, other animals, tame and wild, have been involved in severe epizootics. Lieutenant Gregory says that in Seebsaugor domestic animals alone were not attacked, as deer and other wild animals were found dead in the jungle with the same symptoms,(8) Dr. Coates says "that the disease (Gootee) is contagious among cattle, cows, buffaloes, sheep, goats, and even horses have it".(9) Mr. Stevens adds pigs to the list.(10) It is said to attack horses and other animals in the North-West.(11) Dr. Jackson says that buffaloes, male and female, bulls, cows, bullocks, sheep, and goats are liable to the disease.(12)† I was informed that during the epizootic which prevailed in the South of Jessore in 1866, wild pigs, deer, and buffaloes were found dead in unusually great numbers in the jungle. Dr. Palmer, who does not believe in the communicability to horses, gives a very remarkable instance in which two horses apparently caught the disease by infection and died of an affection very similar to the Calcutta epizootic.(13)‡

(8) II. (9) VII. (10) XV. 1. Also XXIII. 5. (11) X. (12) XI., 2. (13) X., p. 4.

14. While there is a strong probability of epizootics spreading by other agencies than infection, there are many remarkable instances on record of its importation by diseased animals. This will be more particularly discussed in the next Section.

15. A locality in which an epizootic has recently prevailed does not suffer so severely when visited a second time.(14)

(14) II.

These laws of the mode of origin and spread of epizootics apply equally to epidemics of disease among men. This will appear from a perusal of the excellent remarks of Dr. Aitken on the laws of endemic and epidemic influence, and the facts stated in the preceding paragraphs are familiar to the student of human medicine.

'Accurate information upon the place and mode of origin of epizootics, the manner, direction, and rate of spread and generally on all the points summarized in the foregoing, is much wanted, and the exact relations of epizootics and epidemics have still to be worked out.

I shall here transcribe for the purpose of reference and comparison Dr. Aitken's principal conclusion.

Specific disease poisons.—The matter by which the specific miasmatic diseases are communicated and propagated is solely derived from the body of the similarly diseased human or animal being; for there, during the course of the specific disease, is the soil in which the specific poison is bread to multiply and propagate its kind.

Endemic influences result from those condition or agencies peculiar to a locality which favor the development of various miasmatic diseases.

They become active through the following conditions, namely :—

1*st.*—The specific poisons are never totally in abeyance.

2*nd.*—The germs of specific diseases are always extant and develop under favorable conditions becoming epidemic influences.

3*rd.*—These diseases are characterised by alternations of slumber and activity, prevalence in one place, while neighbouring places are free and successive invasion of neighbouring places.

4*th.*—The specific morbid poison, which is a constant element, is capable of transmission from place to place, alternately breaking out and becoming dormant.

5*th.*—In large towns the fever poisons are always present, in country places they only now and then occur. When disease is developed in the latter places the ratio of persons or animals attacked is greater.

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* In Satkeerah, 24-Pergunnahs, it is also described as travelling eastward. (XX.)

† Major Lamb, Deputy Commissioner of Durrung, remarks that large numbers of cows, swine, fowls, ducks, and pigeons have been carried off this year (1867). (XXXV. 1.)

‡ Dr. McPherson (XXXI. p. 14) alludes to a disease among fowls, which has sometimes prevailed simultaneously with Small-Pox in Lower Bengal, but often quite independently of it. This disease is still very common in the district of Jessore, it affects hens and turkeys and prevails most in the hot weather. I have no facts showing its relation to other epizootics. It is called Gootee, &c., by the natives.

6*th*.—In country places the dung heaps, &c., are the principal media of diffusion.

7*th*.—All the specific diseases multiply their kind after similar means of propagation.

8*th*.—All of them establish a constant series of morbid changes and lesions, and always issue in the production of its own specific germ or miasma.

9*th*.—Certain receptive conditions or a predisposition exist in individuals which appear essential to the development of the specific poisons and the establishment of the disease, and an immunity against a repetition, is generally conferred by one attack.

10*th*.—Putrescent emanations seem to favor the development and spread of these diseases.

Laws of Epidemic influences.

1*st*.—Predispose to disease independently of any other cause.

Give increased energy to other causes, and give rise to new and anomalous forms of disease.

2*nd*.—Give rise to peculiar types of prevailing diseases.

3*rd*.—Impress other diseases with their peculiarities.

4*th*.—Their manifestations are preceded by modifications in the character of prevailing diseases.

5*th*.—First effects most violent.

6*th*.—Sometimes disappear entirely after a short prevalence; sometimes continue with intermission, 2, 3, 4, or 5 years.

7*th*.—Different epidemic diseases are apt to alternate.

8*th*.—The lower animals are also subject to epidemic influences. XXX. p. 213—223.

V.—Causation.

On this head the information is necessarily somewhat speculative. The subject resolves itself into the two usual divisions of predisposiiting and exciting causes.

1. Of the *predisposing causes* the most important is *season*. The more severe epizootics of which we have a record have occurred either during the cold weather or towards the close of it. The Assam epizootic of 1853 raged from January to June.(1) Lambert writing in June states that the Ceylon epizootic of 1842 had raged for many months. (2) Captain Nelson writing in July, states that the Madras epizootic had lasted three months.(3) The Darjeeling epizootic broke out in November(4) and again in April, and subsequently in August and September. The Calcutta epizootic broke in January and continued till April.(5) The Tipperah epizootic seems to have broken out in February.(6) The Backergunge epizootic broke out also in February(7). Dr. Jackson writing from Balasore says:—"natives state that December, January, and the early part of February are the worst months during the year, The virulence begins to decrease on or about the latter month (8) Other reports vary slightly. In Hooghly it is said to appear every year in the beginning of the hot season.(9) In Bhaugulpore it is said to attack cattle during the winter months.(10) In Behar it is stated to prevail at the conclusion of the hot weather and beginning of the rains.(11) It prevailed in Bograh in May 1866.(12) In Nuddea it is stated to occur in April and May.(13) Mr. Sawers says that "all admit that the disease is worst in April and May. (14). This coincides with the result of my own observations.(15) In the Eastern Dooars Gootee is described as recurring every year in May, June, and July.(16) In Chumparun Gootee is said "to prevail in the rains but may remain a whole year in a herd."(17) Mr. Stevens states that Gootee is prevalent from Cheyt to Assar (April to June), and Khoraha from Assar to Bhado (June to August). (18) Dukuha in Patna is said generally to break out in July and August.(19) In Maldah Gootee is said to commence in August and extend up to April.(20) In Noakally cattle disease is said to prevail in September and October.(21) In Cuttack foot and mouth disease prevailed in July.(22) In the station of Comillah a severe epizootic raged in July and August.(23) In Assam cattle disease is said to break out in April and May and September and October.(24)*

(1) II.
(2) XXVIII.
(3) I. 1.
(4) XVIII., 1.
(5) X.
(6) XVI.
(7) XIII. 1.
(8) XI., 2.
(9) XVII.
(10) XVIII.
(11) VII., 3.
(12) XXIV.
(13) XIX.
(14) VIII., 2.
(15) XXV.
(16) XIV.
(17) VII.
(18) XV., 1.
(19) XV.
(20) VI.
(21) III.
(22) XXII.
(23) XVI., 3.
(24) VI.

* In April 1867, an epizootic of cattle disease broke out and lasted till the middle of August, XXXV. 3.
In British Burmah, according to Mr. Gudgin, Veterinary Surgeon, cattle disease (Puschima) is most prevalent during the latter part of the dry and early part of the rainy season, XXXVI. p. 4.

From the foregoing evidence it is clear that while the epizootics under consideration may occur in any month of the year, they are less frequent during the rains and more common during the dry months, and adopting Dr. Macpherson's division of the year there is reason to think that the same order of prevalence and severity obtains in regard to epizootics which he has indicated with respect to cholera,(1) namely, that the hot months (March, April, and May,) produce most disease; the cold months (November, December, January,) come next; the transition months (February, June and October,) next; and the wet months (July, August, and September,) produce least epizootic disease*. This is readily inferable from the record above given. As to the peculiarities of those seasons in which the disease was most virulent and fatal, I possess no data. The season preceding the Assam epizootic is stated to have been a dry one.(2) The extensive prevalence of an "epidemic" of fever seems to have in 1864 preceded or coincided with an unusual prevalence of epizootic cattle diseases in the Presidency Division. The cold weather of 1865-66 was marked by an early stoppage of rain, and a violent outbreak of fever and cholera in the District of Jessore, and cattle disease broke out violently to the south of the District and extended to Backergunge about the same time. On this head information is greatly wanting, and, now that attention is being directed to the subject, will doubtless, in future epizootics, be furnished.

(1) XIX., p. 6.

(2) XXIX.

2. As to the *conditions of country and soil*, which either produce or favor the spread of epizootic diseases, it is difficult to give an opinion. We have seen that cattle diseases are prevalent all over Bengal, and while there is a general similarity between the state of surface and soil of each district, there is also a considerable variation in particular features and conditions. The most virulent epizootic recorded is the Assam murrain of 1853. This prevailed principally on the banks of the Brahmapootra, in a damp jungly malarious tract. From a perusal of the various papers collected, it is also evident that the disease is more prevalent and severe in the Divisions of Nuddea, Burdwan, Chittagong, Cuttack, Assam, and Dacca, than in those of Patna, Bhaugulpore, Rajshahye, or Chota Nagpore, though the difference is probably not a great one and perhaps only apparent.

3. With respect to the *food* of cattle, Dr. Long lays considerable emphasis on bad food as a predisposing cause of the Assam plague: particularly coarse grass and old dry straw.(3) The Civil Surgeon of Maldah says:—"The disease prevails most when cattle are fed upon grass from lands which have been submerged and when freely fed in the month of August on fresh cut paddy straw.(4)†

(3) XXIX.

(4) VI.

Mr. Terry in Midnapore writes:—"From long experience I find diseases among cattle begin when green food is scarce."(5) Mr. Eyre, Deputy Collector of Sarun, also instances "insufficiency of nourishing green food during the cold and hot seasons"(6) as a cause of Epizootics. There can be little doubt that either an indigestible quality or an insufficient quantity of food as affecting the condition of the animal must be an important predisponent to disease.‡

(5) IV.

(6) XV.

4. The *condition of the animal* was considered by Dr. Long as having an important predisposing effect in favor of infection.(7) Dr. Palmer remarks that in the Calcutta epizootic all kinds of cattle, well conditioned and strong as well as weak and lean, were attacked. (8) He is of opinion that the eczema epizootica selects the ill fed, over worked and weakened constitution.(9) The truth seems to be that in a virulent epizootic all conditions of cattle are liable to attack, while in a less virulent visitation the weakly first succumb.

(7) XXIX.

(8) X., p. 2.

(9) X., p. 5.

5. As to the predisposing effect of *age and sex* there are no facts available, but these conditions have probably little or no influence in determining the course of the disease.

6. In regard to *unsanitary conditions*, overcrowding, damp, neglect of cleanliness, &c. There can be no doubt from analogy that these conditions must exert a baneful effect in favor of the spread and severity of the diseases under consideration. Dr. Long in his excellent report of the Assam epizootic insists strongly upon the predisposing influence of such conditions, and it is important to note that in this epizootic the cattle of the Revd. Mr. Higgs,

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* With regard to individual diseases, Khorah would seem to be most prevalent during or after the rains, Gootee during the hot months, and Puschima during the cold months.

† A very interesting observation confirmatory of this view has come under my notice: a gentleman in this district found that when his sheep were allowed to graze on grass which had been submerged by the unusually high inundation of this year (1867) they contracted and died of a disease exactly resembling Puschima. He lost thirteen sheep of this disease during the month of October. He then caused all his sheep to be house, fed and the disease disappeared.

‡ Mr. Gudgin, Veterinary Surgeon, in a report on Cattle Disease in British Burmah, makes the important observation that cattle allowed to feed on the rank grass of the early rains after having been accustomed to the dry fare of the previous months are very apt to have "Black Quarter," an inflammatory fever accompanied by erysipelatous swelling of one or more limbs.—XXXVI., p. 3.

which were more favorably circumstanced in these respects, suffered from a milder form of disease than was prevalent in his neighbourhood.*(1)

(1) XIX.

The Assam epizootic was a peculiarly malignant one, and the description given of their condition shows that the comfort and cleanliness of the animals were greatly neglected. An important fact is also mentioned by Dr. Long in the same paper. He says that neither the Mesries nor their cattle suffered from the then prevailing diseases, and he attributes this to the care with which both men and cattle were housed and protected from the influences of damp and malaria. Mr. Lambert of Ceylon also attributes the immunity which his own cattle enjoyed for months from the disease which was prevailing in surrounding plantations to the "generous diet, absolute isolation and care bestowed upon his cattle."(2)

(2) XXVIII.

What the *exciting causes* of the various forms of epizootic disease under notice are, we have as yet no positive evidence, and the opinions entertained on the subject are rather inferences from the strict analogy which obtains between epizootics and epidemics, and from a consideration of the circumstances of the mode of appearance and spread of the diseases themselves.

1. The most probable theory on this subject is that these diseases are caused by a specific poison. In what manner this poison was primarily generated, whether it was originally derived from the soil, or whether it is now capable of being developed under peculiar conditions of atmosphere and soil, are questions which we cannot in the present state of science answer. Under favoring meteorological and other conditions† this poison becomes active, and entering into the animal along with the air it breathes, the water it drinks, or the food it eats affects the blood and nervous system primarily and the tissues of the body secondarily, setting up a definite and characteristic specific train of symptoms, multiplying in the body and stimulating a morbid activity of the various outlets of the organism, thereby causing eruptions and discharges by and along with which the poison tends to be eliminated from the body. These discharges are believed to contain the poison in abundance and to be capable in suitable circumstances of generating the disease in another animal.‡

2. The spread of the disease must depend upon the condition of the poison, the substances to which it may attach, or the agencies by which it may be removed from one locality to another. A gaseous poison will spread by simple diffusion through the atmosphere and will be wafted by the wind; a liquid poison will attach to water or to solid substances; a solid poison may be dried and wafted by the wind or adhere to articles of clothing, houses, straw, &c., a parasitic infecting agent will be propagated by contact or by means of clothing, &c.§ A poison which is generated under circumstances peculiar to a particular place is, with reference to human disease, endemic: when it is developed so intensely or abundantly as to spread over large tracts of country and affect masses of men, it is epidemic. These statements are at present generally held by Physicians, and might be abundantly illustrated. I have brought them forward in the foregoing terse form, because they apply as appropriately to and may be illustrated as aptly by the epizootic diseases as by the epidemic. This will appear from a consideration of the "modes of origin and spread" of epizootics already dwelt on. We can also understand why the dry months are more favorable to the appearance and spread of these diseases than the wet, as already shown.‖

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* The precise conditions of this kind which appear to affect animals in this country are—

1*st*.—Housing in low damp sheds where they are congregated in too great numbers, and this obtains more during and after the rains than at any other time of year. Cattle are carried away for the purposes of cultivation from the baree of the owner to bheels at some distance, and herded together in wretched sheds very slightly raised from the surrounding water. I have seen some miserable examples of this in the Sunderbunds.

2*nd*.—Over work. During the busy season cattle are not only over worked, but worked walking up to their bellies in water.

3*rd*.—Neglect of rubbing down. This ought always to be done when the cow is wet from perspiration or water.

4*th*.—Bad food and drink, hard old straw, coarse grass and bheel water.

5*th*.—Working too long at a time in a hot sun without food.

† These conditions are high temperature, moist soil, absence of rain, great evaporation, and generally states of atmosphere favoring putrefaction. That the diseases in question are capable of being generated in a locality of being manifested in an endemic (enzootic?) or epizootic form is rendered highly probable by the observation of Major Lamb, who, in discussing the origin of an epizootic in Assam, (1867) observes that the disease made its appearance *simultaneously* in several Mouzahs in the Durrung Mehal. (XXXV. 1.)

‡ There is another source if not of the development, at any rate, of the multiplication and intensification of certain poisons, particularly those of typhoid fever, cholera, and dysentery indicated by the observations and experiments of Simon Theirsch and Pettenkoffer, besides their development within the animal body, namely, that which takes place during the decomposition of accumulations of the evacuations of these diseases, under influences favoring putrifaction. XXXII. p 225 and 226.

§ Mr. Herrold, (XVIII.,) hints at the probability of flies being the means of conveying the infection from one animal to another. Not only is this highly probable, but the agency of jackals, dogs, cows, vultures, kites, &c., may be the means of infecting pasturages and dispersing disease of an epizootic character. If, as there is every reason to believe, the poison of specific diseases is portable, the possible agency of the lower animals in conveying it cannot be denied and may serve to spread even diseases peculiar to man. But in the case of carrion birds and animals, actually feeding on the corpse of a diseased animal, the probability of conveyance to other animals is much stronger. This constitutes one strong argument in favor of burial.

‖ The effect of rain in putting a stop to epidemics is a well recognized fact. MacPherson says "the two most important agents in diminishing the prevalence of cholera appear to be a heavy fall of rain and diminished range of temperature." (XXXI. p. 7.) In the October number of the *Indian Medical Gazette* for 1867, there is a remarkable illustration of an epidemic of cholera having been put a stop to by a heavy fall of rain.

There can be no doubt that the exciting causes of epizootics are constantly present throughout Bengal, giving rise in healthy seasons to sporadic cases and mild visitations, and in unhealthy seasons, that is, under circumstances favoring their development, to wide spread and fatal disease.*

3. Without enlarging on these speculative points the practical and important point of *infectiousness* remains to be considered. The great majority of those who have reported on epizootics are agreed on this subject, and consider the diseases under discussion highly infectious. Such was the opinion of Dr. Long with reference to the Assam Epizootic :(1) of the Civil Surgeon of Maldah :(2) of Dr. Coates of Chumparun :(3), of Dr. Barry :(4), of Dr. Palmer :(5), of Dr. Anderson :(6), of Dr. Bensely of Backergunge :(7) of Mr. Sawers of Culna(8) and of numerous non-professional reporters (9)

(1) XXIX.
(2) VI.
(3) VII.
(4) VIII., 1.
(5) X., p. 1.
(6) XIX.

Dr. Long reports an instance of a diseased cow having infected five others.(10) (Gootee.) Dr. Palmer says that there is ample proof that many healthy cattle contracted the disease (Puschima) at the exhibition and carrying it to their homesteads infected others.(11) The Magistrate of Backergunge states. "The attack at Lahory was at first so mild that not more than two head of cattle perished in April. An inhabitant of the neighbouring village of Ghazeepore bought a cow apparently in good health at Lahore and took it home. Within a day or two of the purchase the animal sickened and infected almost all the cattle in the neighbourhood, large numbers of which perished."(12)† This is a most interesting and important observation, and tends to show that there must have been something in the sanitary condition of Ghazeepore predisposing to a severer form of disease than at Lahory. In such an instance as this it would be highly important to determine accurately what the difference of condition was which in one case determined a mild and in the other a severe form of the same disease. There can be little doubt that a diseased animal is capable of infecting others not diseased, and *under suitable circumstances* of spreading the disease. The evidence adduced is at any rate strong enough in favor of the infectious nature of the disease for practical purposes, and the belief should be acted on as if it were a certainty. When on the subject of treatment, I shall notice several striking instances of precautions against infection having apparently warded off the disease from large numbers of cattle.

(7) XIII., 1.
(8) VIII., 2.
(9) XXXV.
(10) XXIX.
(11) X., p. 1.
(12) XIII., 1.

The question of endemic origin or importation differs from that of infectiousness. The former is still under dispute and uncertain, and the latter beyond reasonable doubt. Mr. Gudgin, Veterinary Surgeon, in his history of the Cattle Disease (Puschima) of British Burman(13) discusses the question:—was the disease imported? or is it indigenous? He inclines to the former opinion, and assigns the following reasons in support of his opinion:—

(13) XXXVI. p. 3.

1*st*.—There is every facility for importation of the disease into Burmah by the annual cattle trade between that and surrounding States.

2*nd*.—The disease has been more prevalent of late years, and there is reason to think that communication between districts has become more general and easy.

3*rd*.—If the causes of disease were indigenous, depending on some bad condition of soil and atmosphere, these would affect the general health and condition of stock. He admits, however, that the poison has during the last few years been always present in the country, and when favored by suitable circumstances has given use to wide spread disease. This admission considerably weakens the force of the argument. Even with regard to human diseases it is most difficult to speculate on the primary origin of specific disease poisons, as the whole subject is so wrapped up in hypothesis.(14) These diseases must undoubtedly have been due to causes external to man, on their very first appearance, and it is highly probable that such causes and the conditions of their development still exist, yet so involved and difficult is the subject that even when a disease, such as Cholera or Puschima, is proved to have sprung up in a district at many independent centres at the same time, the advocates of the importation theory can ascribe the phenomena to the arousing into activity of numerous dormant poison germs by favoring physical conditions. As to cattle diseases data are wanting to determine the

(14) XXXII., p. 218.

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* The analogy between the laws affecting the prevalence of cholera and the circumstances regulating the appearance and diffusion of epizootics is striking, and a perusal of Dr. Macpherson's work (Chapter I, III) will reveal the close correspondence. These circumstances are stated by Veterinary Surgeon Gudgin to be "epidemic influence," increased activity in the cattle trade, or when the healthy state of the herds of buffaloes has been lowered by drought, innutritious or insufficient food or the digestive organs functionally deranged by sudden access to luxuriant pasturage. XXXVI., p. 14.

† The report of Mr. Gudgin, Veterinary Surgeon, on cattle disease in British Burmah, details several remarkable instances of the disease (Puschima) having been introduced into villages by cattle brought from localities where the disease has been prevalent.

Mr. Gudgin also makes the important remark that places where cattle are bought and sold, and when there is every facility for importation, suffer more from cattle disease than isolated localities. XXXVI., p 4.

question, and for practical purposes it is safest and best to believe both hypothesis, namely, that epizootic diseases are sometimes due to endemic causes without importation, and sometimes to importation with favoring endemic conditions, as there are facts which favor both opinions and they are not in any way opposed to or inconsistent with one another.

IV.—Symptoms.

In all the epizootic diseases under consideration, there are two classes of symptoms observable:—1*st*, general constitutional symptoms of a febrile kind merging into a typhoid condition and prostration in severe cases; and 2*nd*, local symptoms of a more or less specific character.

I.—The symptoms of Eczema Epizootica, "Foot and Mouth Disease" or Khorah, vary considerably in degree from a simple vesicular eruption upon the feet and mucous membrance of the mouth with little or no constitutional disease, and small mortality, to an eruption of a vesicular nature, covering a large extent of the surface of the body, accompanied with febrile and other constitutional symptoms of a severe kind, resulting in death in a great proportion of cases. It is of importance to note this variation of symptoms, and it will generally be found that the severity of individual cases depends upon the mild or severe nature of the epizootic. The *period of incubation* of this disease has been very definitely fixed by a series of experiments conducted by the Royal Veterinary College in London. The disease was produced in healthy cattle by feeding them with hay saturated with the saliva of diseased animals. The effects were developed in 36 hours(1).

(1) XXX., p. 85.

These experiments are also interesting as demonstrating the contagious character of the affection, and showing that the discharges from the site of specific local disease are capable of conveying the infection.

The importance of this fact with reference to sanitary and preventive measures is great. A severe attack of this disease is usually ushered in by fever of a remittent type.(2) Whether this is preceded by any signs of constitutional disturbance, as lassitude, restlessness, disregard of food, &c., does not appear. Shivering fits are described. (3), Rumination is suspended;(4) the appetite is lost;(5) and there is great thirst;(6) the skin is rough, hot and dry,(7) the udder is hot and tender to the touch;(8) the eyes and mouth water.(9) In cows lactation is diminished(10). The urine becomes high colored(11) and diarrhœa of a dark green color and very fœtid is described.(12)

(2) XV., 1. XXX., p. 86.
(3) XXX., p. 86.
(4) XXX., p. 86.
(5) XV. XV., 1.
(6) XV., 1.
(7) XV.
(8) XXX., p. 86.
(9) XV.
(10) XV., 1.
(11) XV., 1.
(12) XV., 1.

How soon after the appearance of the constitutional disturbance the specific local effects arise, I have no data to show. Sometimes the feet are mainly or exclusively affected, and sometimes the mouth, and in bad cases the eruption is found on the udder, the organs of generation, and the spaces between the digits.(13) The eruption is purely vesicular, consisting of small blisters, containing a transparent fluid; the tongue, roof of the mouth and lips are covered with these. The coronets of the feet become hot and swelled, and similar vesicles are found between the claws. When the feet are severely affected lameness invariably ensues.(14) When the disease is fatal death is caused by the severity of the constitutional derangement and occurs on the eighth or ninth day(15). In most cases the general disturbance abates, the vesicles dry up and become crusts, the appetite returns, and the cow is well in fourteen or fifteen days.* The mortality of this disease varies with the type of the epizootic. It is put down by Mr. Stevens, on whose intelligent description I have drawn for much in the foregoing,(16) at 25 per cent. of cases. Of 42 of the cattle belonging to the Royal Artillery at Cuttack, 34 had recovered and the remainder were convalescent when the report was written.(17) In this case the animals were carefully treated, and I am inclined to think that Mr. Stevens's proportion is rather high. Mr. Herrold(18) says that *if not well attended to* 10 per cent. of the animals die.

(13) XXX., p. 80.
(14) XXX., p. 87.
(15) XV., 1.
(16) XV., 1.
(17) XXII.
(18) XVIII., 1.

The *complications* of the disease including the effects of want of proper care are:—

1*st*.—Ulcers on the mouth and udder caused by breaking of the vesicles.(19) These are often troublesome and frequently those of the mouth occasion death through inability to take sufficient food.

(19) XXX., p. 87. XXIII., 2.

2*nd*.—Ulceration of the foot and disorganization of the horny material of the hoof(20), sometimes the hoof falls off(21); this event is generally the result of neglect of proper treatment.

(20) XXX., p. 87.
(21) XXIII., 2.

3*rd*.—Development of maggots and consequent ulceration and inflammation.(22) This also results from neglect of the proper measures to prevent the attacks of flies and very often causes the death of the animal.

(22) XVIII., 1. XV.

It is of extreme importance to bear these complications and their mode of occurrence in mind, because it is from them that in most cases death occurs and they are as a rule preventable.

* "Curable in ten days," Mr. Cockburn (VI.)

II.—I now proceed to the symptoms of the disease distinguished as "Gootee" or "Boshonto." In Khorah the local manifestation constitutes the most prominent symptom of the disease, and except in severe cases or epizootics the constitutional disturbance is of secondary concern. In this disease on the contrary the local manifestation is of small concern, and the constitutional derangement most serious and severe. It is from the latter, the natural sequence and duration of constitutional symptoms, that the disease derives its specific character, more than from the eruption, though the latter is *when present* also characteristic enough. A comparison of the various accounts given of different epizootic manifestations of this disease clearly shows that there is a very considerable variation in the severity of the symptoms and type of the disease—that while in one case of epizootic the disease may be comparatively mild, and the mortality, though always great, not extreme, in another case of epizootic the type may be malignant and the mortality excessive. It will be also noted that in some epizootics of what was undoubtedly Gootee no eruption was observed in many cases,* while the grouping and sequence of the symptoms leave no doubt that the disease was the same as that in which an eruption was observed. The character of any case in an epizootic must be considered in relation to the broad typical features of the disease as obtained from a generalized comparison of several well marked cases carefully examined, and I would strongly deprecate the tendency to remove individual cases of disease into another category, because a particular manifestation was absent or ill developed. It is also to be observed that the word pustule has been undoubtedly used in the description of this disease by unprofessional observers in a loose and general sense, and much obscurity and confusion is introduced into the subject from the apparent application of the term to denote any eruption, whether vesicle (a small pointed bleb or bladder containing transparent fluid) pustule (a small more or less circular or rounded bleb or bladder containing pus or yellow matter) or crust (concreted lymph or pus embedded in a small ulcer). This distinction ought carefully to be borne in mind in future descriptions of epizootics. The disease under notice is undoubtedly the most wide spread and fatal in Bengal, and I shall therefore go into its symptoms in detail. I am fortunate in having myself seen and examined carefully several cases of the disease, and in having descriptions of the disease written by several Medical Officers, Dr. Long of Assam, Dr. Coates of Chumparun, the Civil Surgeon of Maldah, Dr. Jackson of Balasore, Dr. Greene of Tipperah, and Dr. Bensley of Backergunge, and by several non-professional gentlemen of great intelligence.

Having premised these general remarks, I shall first give the details of what I conceive to be a typical manifestation of the disease and then a description of the severer forms.

As to the period of incubation of this form of disease, I have no facts from which to draw a reliable inference. It is probably short judging from the observation of the Magistrate of Backergunge, already quoted(1) (p. 11.) The point might be easily fixed by observing how soon after the introduction of a diseased animal into a healthy locality or herd the disease appeared, or experimentally by inoculating healthy animals with saliva or lymph, or giving them food saturated with the former.

(1) XIII., 1.

The premonitory symptoms are stated by Dr. Long,(2) to be as follows:—The animal is observed to become listless and dull, to stand apart from the rest. The skin becomes dry and rough, and there is a short dry not frequent cough. The animal does not feed so heartily as usual, and in cows the quantity of milk is diminished.† A careful observer will probably in all cases be able to observe these symptoms of impending disease, which are generally overlooked. Their importance with reference to treatment cannot be over-rated.

(2) XXIX.

After this condition has lasted two to four days, fever, either preceded by shivering(3) or not, sets in. The appearance of shivering or fever marks the commencement of the *second or febrile stage* of the disease. It generally lasts two or three days(4)‡ and its symptoms are—

(3) XXV.
(4) XXIX. VIII., 2. XI., 2. XVI., 2. XIII., 1. XXX.

1*st.*—Elevation of temperature; this is best observed in the axilla, at the root of the horns or in the inside of the ear.

2*nd.*—Roughness of skin caused by elevation of the hair (horripilatio) and dropping back of ears.

3*rd.*—Increased pulse and accelerated breathing.

4*th.*—Complete refusal of food.

(5) XXIX. VI.—VII. XVI. 2.

5*th.*—Absence of rumination.

6*th.*—Intense thirst§(5.)

* This is pointedly brought out by Mr. Driberg of Mungledyo, Assam, who says that in the epizootic of 1867, "in some cases an eruption breaks out." XXXV., 3.

† Mr. Driberg of Mungledyo, Assam, describes the premonitory symptoms as partial loss of appetite and great lassitude. (XXXV., 3.)

‡ Dr. Cates states the duration of the fever to be eight or nine days (III.) This I think must be overstated.

§ Major Lamb in an epizootic of Gootee in Assam states as one of the symptoms.—"Refusal of food *and drink*." XXXV., 1.

7*th*.—Watering of eyes which become inflamed, sometime chemotic.

8*th*.—Slavering and discharge of watery fluid from nostrils. Dr. Long states that in this stage vesicles may be seen in the mouth.

9*th*.—Dry muzzle which presents a curious reticulated appearance.

10*th*.—Cough occasionally.(1)

(1) VI. XI. 2.

11*th*.—Swollen tongue covered with pointed elevations.

12*th*.—Urine high colored, like blood.

13*th*.—General appearance of severe sickness, head drooping, back up, flanks hollow, posture not altered and eye dull or bleared.

(2) XV. 1.

14*th*.—In cows lactation is completely suspended in this stage.(2)

These are the manifestations of a general febrile disorder, and in varying degrees of intensity may be noted in every case.

It were desirable that the variations of temperature and pulse were noted in order to determine accurately the exact character of the fever. This could only be done by careful repeated observations of the same animal.

On the third or fourth day (reckoning from the commencement of second stage) *the third or eruptive stage* sets in.

The eruptive nisus affects the mucous membrane of the intestinal tract causing first diarrhœa and then dysentery, and the skin of the body causing an eruption.

The diarrhœa usually precedes the appearance of the eruption by a day. Dr. Long says that it supervenes on the second day ; (3) Dr. Greene says the third day(4) Mr. Sawers the second or third day ; (5) and Dr. Bensley the third or fourth day.(6) The stools are described as "broken up, slimy, frequently fœtid"(7) "serous mucous and sometimes bloody"(8) "brownish, black, watery and very offensive" ; (9) "thin but foul in smell," "watery," &c. All observers agree in stating that dysentery succeeds to the diarrhœa. Its period of appearance is not very well fixed, but the fifth day may be taken as an average.

(3) XXIX.
(4) XVI., 2.
(5) VIII., 2.
(6) XIII., 1.
(7) XXIX.
(8) XIII., 1.
(9) XVI., 2.

The eruption makes its appearance on the fourth or fifth day. (10) It is essentially vesicular. Dr. Long calls it an "eruption of dry pustules—" scabs (?) : Dr. Coates describes "papules succeeded by pustutes :" Dr. Jackson, "vesicles which subsequently maturate." Dr. Greenel, "minute elevations beneath the skin :" Dr. Bensley, "pimples or scabs." In the cases which I examined, I observed only scabs, consisting of small black or light yellow crusts set in small ulcers and surrounded by a ring of redness. The extent of the eruption and the size of the vesicles varies in different cases. Most commonly the udder, the stomach, the axillæ and lower part of the neck only are covered ; but in some cases the whole body breaks out. Dr. Coates states that the mouth, palate, and alimentary canal are attacked with pustules. Mr. Stevens says that it extends to the tongue and throat.* The hair in the vicinity of the vesicle loosens and may be wiped off. The extent to which the hair may be removed is a good index of the severity of the eruption. In some cases it is removable to such an extent that the skin is wholly denuded of pile, red and raw.(11) In some cases there is no eruption observed, and some epizootics are characterised by greater freedom from eruption than others. These appear to be more malignant than those in which a copious eruption appears. Some observers have remarked that cases in which the eruption is copious do better than those in which it is scanty or suppressed.(12) This accords with what I have myself been told by natives. I doubt much if any case which survives the fifth day will on careful inspection be found free of a cutaneous affection of some sort, and I suspect that small papules, pimples, or crusts giving a sense of roughness to some parts of skin, will be found in all such cases ; any case dying before the fourth day will of course show no eruption. During this stage the constitutional symptoms undergo a change. The fever intermits, assumes a typhoid type or yields to prostration. The pulse becomes small and weak retaining its rapidity. The temperature diminishes, and the extremities become cold. Refusal of food and suspension of rumination continue ; thirst abates ; the eyes become redder and the discharge turbid or actually purulent. The nostril and mouth discharges are apt to become brownish and fœtid. Aphthous-looking ulcers are found sometimes on the lips and gums. The tongue becomes more swollen and dark. Prostration increases and the animal eventually lies down. Wasting sets in. The glands of the throat are observed to swell in severe cases, and in some cases the stomach. Flies attack the discharges and mucous orifices. Ulcers are prone to form and the animal is liable to die of exhaustion. When death ensues it does so at a period varying from five to ten days, and recovery is slow and in many cases imperfect.

(11) I., 2.

(12) VI. XX.

* Sore feet and lameness are described by Mr. Driberg in Assam (1867.) XXXV., 3.

The *duration* of the disease from the commencement of the first stage to the occurrence of death or a change for the better is put down by Dr. Long at twelve days,(1) by Mr. Hope, at five to ten days,(2) by Mr. Sawers at five to eight days,(3) by Lieutenant-Colonel Agnew at seven to fifteen days,(4) by the Deputy Magistrate of Behar, at a week to ten days,(5) Mr. Eyre of Sarun, at five days,(6) by Mr. Stevens at eight or nine days,(7) by Dr. Greene at six or seven days,(8) by Dr. Jackson, at ten or twelve days.(9) Four to seven days is reported from Beerbhoom as the duration,(10) five to seven from Durjeeling,(11) five to eight from Jessore,(12) four to fifteen from Durrung,(13) six to seven from 24-Pergunnahs,(14) six to seven from Singbhoom,(15) and two to ten or eleven days from Jessore.(16) The duration of the disease in cases which recover, that is, the time which elapses between the first appearance of symptoms and the complete restoration of health is from fifteen to twenty days.(17)

(1) XXIX. (2) VII., 3. (3) VIII., 2. (4) XIV. (5) XV. (6) XV. (7) XV., 1. (8) XVI., 2. (9) XI., 2. (10) XVII. (11) XXXV., 1. (12) XVIII. (13) XIX. (14) XX. (15) XXXIII., 5. (16) XXV. (17) XV., 1.

Mr. Sawers of Culna says that a second attack of Gootee is "almost unknown."(18) This is a highly important observation, and the subject merits careful attention and inquiry with especial reference to the subject of inoculation.

(18) VIII., 2.

The number of cattle lost from this disease throughout Bengal yearly is very great: the mortality in some accounts is put down as hundreds, in others(19) as thousands.(20) Particular epizootics have been extremely fatal. In Assam the loss of cattle is estimated at 1,20,000,(21) in Backergunge, at 30, or 40,000,(22) in Tipperah, at 15,482,(23) and in one Sub-division of Jessore, at 12,000.(24) The rate of mortality is very high. The estimates vary somewhat, and are all more or less speculative and perhaps exaggerated. Dr. Long estimates that 70 per cent. of the whole stock were attacked and 45 per cent. or 64·2 per cent. of those attacked, died(25) Dr. Jackson says that one-third to two-thirds of those attacked die.(26) In Tipperah the mortality was reckoned to be 90·5 per cent.(27)

(19) IV., 1. I., 2. (20) X. (21) XXIX. (22) XIII., 1. (23) XXI. (24) XXV. (25) XXIX. (26) XI., 2. (27) XXI.

In the station of Commillah of 108 cattle 60 or 55 per cent. were attacked and 55 or 50·9 per cent. of the whole (91·5 of the attacked) died.(28) My own inquiries lead me to conclude that about 90 per cent. of the cattle were seized, and that about 90 to 95 per cent. of those attacked died.(29)* These statements are vague and go no farther than to show that the mortality is very serious in all epizootics of this nature and more so in some than in others.

(28) XVI., 1. (29) XXV.

In the severer manifestations of this disease, such as were observed by Dr. Long in Assam, the following additional symptoms were noted :—

1*st.*—Earlier fœtor of the breath and discharges.

2*nd.*—Earlier and more severe swelling of the glands of the neck proceeding to suppuration and ulceration.

3*rd.*—More violent fever at the commencement, and more rapid wasting and prostration.

4*th.*—Earlier cooling of the body and wasting.

5*th.*—Dejections more fœtid and dysenteric.

The complications which are apt to occur in course of this disease are :—

1*st.*—Inflammation of the lungs. This I am inclined to think is rare. The symptoms of this event are frequent cough, accelerated breathing, quick pulse, evident pain in one or both sides, increased by pressure, a peculiar low grunt or loud moan and dulness on percussion, a crackling sound being heard when the ear or stethoscope is applied.*

2*nd.*—Ulceration of the vesicles on the udder or mouth.

3*rd.*—Confluence of those on the skin.

4*th.*—Ulceration of the glands of the throat.

5*th.*—Development of maggots in the ulcers or at the mucous orifices.

6*th.*—The condition of "Fardel bound," or stuffing of the third stomach with dry food. This condition can hardly be recognized unless evident pain or distension of stomach with grunting lead to a suspicion that it exists. It should, however, be guarded against in every case by means to be afterwards detailed, because *post mortem* examination reveals its frequent occurrence, and the disease is of itself sufficient to kill the animal.

7*th.*—Tympanitis or flatulent distension of the first stomach probably dependent in most cases on the preceding condition but occasionally perhaps caused otherwise. This condition cannot be mistaken, the belly becoming enormously swollen.

8*th.*—Erysipelatous inflammation of the connective tissue. This was more particularly observed in the malignant epizootic of Assam.

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* Mr. Stevens says that the proportion of deaths to seizures is 60 per cent. XV., 1.

† This indicates Pneumonia: a wheezing, whistling, or bubbling sound will indicate Bronchitis.

III.—Before going on to describe the non-eruptive epizootics, I shall here give for comparison a short detail of the symptoms of true cow-pox—vaccinia. This is all the more necessary, as the disease considered in the preceding section is frequently called cow-pox, simply because it is characterised by an eruption (pocks) affecting cattle.

In vaccinia the constitutional symptoms are slight or wanting, and the local symptoms or specific manifestations well marked and prominent. The latter constitute the essence of the disease.

After a period of incubation of from six to nine days(1) a faint blush may be observed upon the udder which is hot and tender. This continues for two to three days, and is succeeded by a patchy redness quickly followed by the appearance of raised papillæ or pimples. In three to five days these increase to the size of pea and become vesicles containing a transparent viscid fluid. These increase to the size of a horse bean, are depressed in the centre, and are round or oval in shape, measuring eight to ten lines in diameter. In two or three days they become yellow and are converted into pustules, which assume an acuminated form and contain a thick viscid yelkowish material. A scab or crust ultimately forms. These are dark brown or black, solid, round, flat or uniform, and are embedded in a small pit with a raw surface and white central slough. They spontaneously separate on the twentieth or twenty-third day, leaving a shallow smooth, oval, or circular pit of a pale rose or whitish color, with some traces of induration around it.

(1) XXXI., p. 278.

The constitutional symptoms are slight fever, dry muzzle, slightly accelerated breathing, fastidious appetite and diminution of the secretion of milk. These appear after the local symptoms manifest themselves and decline as they advance.(2) Cattle suffering from this disease are liable to a purely vesicular eruption over the body, which appears on the ninth or tenth day of the vaccine disease.(3)

(2) XXX., p. 230.

(3) XXXI., p. 276.

"The vesicles within 24 hours contain a pellucid serous fluid raising the epidermis. On the following day they become turbid, the cuticle collapses or bursts, and a thin brittle, flimsy crust forms and speedily falls off; successive crops continue to form and desiccate for three or four weeks."

IV.—The terrible epizootic known as Puschima, and which Dr. Palmer believes to be identical with rinderpest, is characterised by severe and malignant constitutional symptoms, the absence of any cutaneous eruption, and by specific lesions of the mucous and intestinal track with swelling of the adjacent glands. The disease may be divided into three stages, premonitory, febrile, and diarrhœic.* In describing these I shall mainly follow the careful and exact observations of Mr. Rutherford, referring for confirmation to other records.

The period of incubation appears to be short. In the Ceylon epizootic it is stated that a few days only elapsed after removing the cattle to a place where they were exposed to infection, when the first case appeared.(4) Mr. Floyd removed a cow laboring under disease from the Alipore Exhibition to his farm. In a week another cow was taken ill.(5)

(4) XXVIII.

(5) X., p. 3.

(6) XVIII.

Mr. Herrold states that a few days after the arrival of some new cattle at Darjeeling two of them took ill.(6)

These data are very vague, but they point to the probability of a short period of incubation.† In this disease death may occur in a few hours after seizure.

When the case goes through its regular stages sequence of symptoms, the following phenomena may be observed:—

(*a.*) The premonitory stage is marked by dulness, disinclination for exertion, refusal of food, restlessness, neglect of calf, failing in milk, and other signs of discomfort and disorder. The duration of these symptoms is not noted, but it is probably shorter than in Gootee, and will, I think, be found to be in a direct proportion to the severity of the subsequent disease.

(*b.*) The febrile stage is in some cases ushered in by shivering.(7) This is followed by the appearance of fever of a remittent type.

(7) XXIV.

The symptoms of this stage are—

1*st.*—Elevation of temperature. This is best observed in the horns and ears which are hot with distinct pulsation of the arteries. The extremities are alternately hot and cold.

2*nd.*—The skin is hot and dry and occasionally clammy, and sweating is sometimes observed; the coat stares (horripilatio) the ears also drop.(8)

(8) XIX.

3*rd.*—Pulse and breathing accelerated.

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* Mr. Gudgin, in his excellent account of this disease in Burmah (XXXVI., p. 16), describes three stages, febrile, diarrhœic, and dysenteric; but I consider my own division more natural and cannot assent to the propriety of splitting up the stage of morbid elimination into two. Indeed, four stages may be distinguished without that, viz., 1, Incubation; 2, Premonitory; 3, Febrile, and 4, Diarrhœic.

† Mr. Gudgin, Veterinary Surgeon, in his report on Cattle Disease (Puschima) in British Burmah, has determined the period of incubation, with considerable accuracy, to be five or twelve days. This is proved by the number of days which elapsed in several cases between the arrival of cattle in a village and the breaking out of disease; five days in one instance, six days in another, and five in a third. He surmises that the period of incubation depends upon the health and idiosyncrasy of the animal infected. XXXVI. 9.

It is now positively known that the animal is capable of propagating the disease during the stage of incubation. (Report of Royal Commission.)

4*th*.—Total refusal of food.

5*th*.—Rumination suspended.(1)

(1) XIX.
(2) XVIII.
(3) XIX.
(4) XV. 1.
(5) XXIV.

6*th*.—Intense thirst is described by Mr. Herrold(2) and by Mr. Norman;(3) but Mr. Rutherford states that the animal refuses drink; in this he is supported by Mr. Stevens(4) who says that the animal *can't* drink, also by the Magistrate of Bograh.(5)*

7*th*.—Eyes dull and expressive of pain; conjunctivæ red and towards the inner canthus ecchymosed spots are sometimes seem. The eye becomes duller and there is a discharge of tears.

8*th*.—Discharge from mouth and nostrils. The former is watery, gradually becoming mucopurulent. The discharge and air expired through the nostrils are fœtid. A sticky saliva mixed with air dribbles from the mouth. The mouth is hot and breath very fœtid; in some cases slight ulcerated spots are observed on the Schneiderian membrane, which is of a deep red hue, small superficial irregularly edged and of a yellow tinge. In some cases also the mouth opposite the incisor teeth shows a few sores.

9*th*.—Muzzle dry, hot, and glazed, marked by two streams of watery discharge from the nostrils. Occasionally a few drops of moisture are exuded which do not coalesce.

10*th*.—Cough is noticed in some instances. It is not constant nor characteristic.

11*th*.—Tongue swollen and coated with mucus and saliva.

12*th*.—Urine diminished in quantity, of a high color and strong smell.

13*th*.—Posture and general appearance indicative of severe distress, the animal stands perfectly still or lies down and groans.(6)

(6) XIX.

14*th*.—In cows the secretion of milk is early diminished, becoming gradually less. It is of bad quality and of a darker color than usual.

I have arranged the symptoms of this stage on the same plan as those of Gootee, in order to exhibit their great similarity, almost identity. This is all the more striking when we consider that each detail presents, not the observations of one man who might be prejudiced in favor of recognising such a similarity, but the independent observations of different men writing at different times of different epizootics in different places, and in each case these are quoted as nearly as possible in the words of the observers.

There is, however, one set of symptoms of great importance which have been noted in Puschima and not in Gootee. These are the *spasmodic movements*. Mr. Rutherford describes catching of the flanks and frequent twitching of the muscles of the flank.

Other observers are silent on this subject, but the phenomena are such as would probably escape the observation of non-professional observers.

The bowels are natural or constipated(7) in this stage. The throat and fauces are inflamed, and the glands of the throat begin to swell.(8)

(7) XIX.
XXXVI., p. 10.
(8) IV.
VIII., 2.
XV. XV., 1.
XVIII., 1.
XIX.
(9) X., p. 9.
(13) X., p. 3.
VIII., 2.

c. It is not clear from the several accounts of this disease how long the second stage lasts or when the third stage sets in. The period probably varies considerably. Judging from a case detailed by Mr. Greenhill(9) the period of duration appears to be twenty-four hours, and the purging sets in on the second day. Mr. Rutherford talks of its setting in early.(10) The discharges are described as "thin ejected with violence mixed with mucus and air and shortly with blood."† They are very fœtid, tenesums subsequently ensues, the amount of blood increases, the dejections become like dirty water and are discharged with violence. No skin eruption of any sort is described by any observer.

The other symptoms now undergo a change. The fever assumes a low typhoid form, the temperature falls, and the animal becomes cold. Remission of the fever takes place once a day or once in two days.

The skin becomes cold and clammy and sometimes cold sweats break out.‡

The pulse becomes quick and tremulous and breath short. The discharges from eyes, nose, and mouth, become more fœtid and purulent or sanious. Flies swarm round the muzzle and deposit their eggs within the lids, nostrils, or lips. The expression becomes duller. The swelling of the throat is more pronounced. Complications involving the stomach and lungs are apt to appear.

Prostration, exhaustion, and wasting advance rapidly § The bowel discharges become dysenteric and more offensive, and in the majority of cases the animal succumbs in a day or

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* Mr. Gudgin, Veterinary Surgeon, in describing the cattle disease in British Burmah, states that "water slowly and with difficulty is partaken of to the end." He also describes cattle as taking to the nearest marsh and immersing their bodies in water. (XXXVI., p. 10).

† "A dark coffee color tinged with blood but more frequently of a dirty yellow color, thin and offensive to the smell." XXXVI. p. 10.

‡ Mr. Gudgin, Veterinary Surgeon, (XXXVI., p. 16) describes a reddened condition of the skin between the hind legs with cracks and sores in some cases.

§ The animal assumes the recumbent position, and the head is either turned to the side or extended to the front in a line with the body (XXXVI., p. 10.)

two after the commencement of this stage. The *duration* of this disease which presents a highly inportant contrast mith Gootee is given by Mr. Rutherford as an average of four days.(1) In Ceylon the average duration seems to have been from 24 to 36 hours.(2) Dr. Anderson says that death takes place in from three to five days.(3) In Burdwan the duration is said to be 48 hours.(4) Mr. Sawers says that Puschima proves fatal in 24 to 48 hours.(5) In Bograh the disease is said to last three days.(6) In Patna the animal is said to die in five or six days.(7) Mr. Norman states seven or eight day,(8) and Mr. Stevens eight or nine days.(9) As to the time in which death occurs. In Darjeeling Mr. Herrold says " no case that I am aware of, except one, extended to the fourth day and many succumbed in less than 36 hours."(10)* The average of four days may be taken as a very approximate one.

(1) X., 3.
(2) XXVIII.
(3) XIX.
(4) IV.
(5) VIII., 2.
(6) XXIV.
(7) XV., 1.
(8) XIX.
(9) XV., 1.
(10) XVIII., 1.

Although the absolute loss of cattle in Bengal is probably less from this form of disease than from Gootee, the ratio of deaths to seizures is much greater.† Mr. Rutherford computes the early mortality of the Calcutta Epizootic to have been 90 per cent. and the later 50 per cent. In individual instances the loss was even greater. Mr. Floyd and Mr. Stalkart are said to have lost *all* their cattle.(11) At Seebpore of 13 head of cattle 13 were attacked and all died. Mr. Stevens reckons the mortality at 60 or 70 per cent. of attacked.(12) Mr. Herrold in about 15 days " had not one left of a herd of upwards of 40 head."(13) Dr. Palmer talks of the disease " making a clean sweep of any yard into which it entered".(14) Dr. Anderson says that whole herds are carried off in a few days.(15) Mr. Deare states that " when it enters a homestead it clears the stall."(16) The Magistrate of Bograh states the mortality to be 9b per cent. of attacked(17) and Mr. Gudgin v. s., 85 per cent.(18.)

(11) X., p. 3.
(12) XV., 1.
(13) XVIII., 1.
(14) X., 2.
(15) XIX.
(16) XIX.
(17) XXIV.
(18) XXXVI.

These statements accord very closely and exhibit the terrible nature of the disease. Recovery when it occurs is tedious Mr. Gudgin,(19) Veterinary Surgeon, says that the disease passes off about the thirteenth or fourteenth day, and that restoration to perfect health takes place about 25 days subsequent to the termination of the attack.

(19) XXXVI., p. 10.

The same authority makes a statement at page 16 that " animals that have had the disease are secure against future attacks." The importance of this statement with reference to inoculation cannot be over-rated and careful observations are required to verify it or otherwise.

The *complications* which are prone to occur in the second stage are :—

1*st*.—Inflammation of the bronchiæ or lungs.

2*nd*.—Tympanitis.

3*rd*.—" Fardel bound."

These present the same symptoms as in Gootee.

V.—For the sake of completeness I shall here insert a short sketch of the symptoms of " Rinderpest," partly taken from Dr. Palmer's paper(20), and partly from Mr. Dobson's book.(21)

(20) P. 7.
(21) P. 162.

In this disease we may also describe three stages, a premonitory, febrile, and diarrhœic.

The period of incubation varies from 7 to 14 days :—

1. *Premonitory stage*.—The principal symptoms are want of appetite, staring coat, diminution of milk, suspension of rumination, and other signs of severe illness.

2. The *febrile stage* is marked by :—

1*st*.—Elevation of temperature. This is variable and transitory.

2*nd*.—Skin hot in some places, especially between the legs, an exudation succeeded by cracks and sores take place. Hair staring.

3*rd*.—Pulse and respiration increased in rate.

4*th*.—Total refusal of food.

5*th*.—Rumination suspended.

6*th*.—Thirst is not described, one account says that in most cases water is refused, another that water will generally be partaken of even to the end.

7*th*.—Eyes water and are red and expressive of suffering.

8*th*.—There is a discharge from the mouth and nostrils. Former hot, red, and inflamed, with often raw spots here and there. Breath fœtid.

10*th*.—Cough is noticed in some instances.

11*th*.—The animal stands with back arched and legs gathered up under the body. If moved it staggers.

* Mr. Gudgin, Veterinary Surgeon, states that the majority of animals affected die on the fifth or sixth day, and that restoration to perfect health occurs in about thirty days.—(XXXVI., p. 10.)

† In British Burmah, according to Veterinary Surgeons Gudgin's interesting report, the loss of cattle from Puschima is most severe. In the space of one or two years from half to two third of the cattle of particular villages were swept away. Mr. Gudgin talks of the disease " decimating herds," " killing off by hundreds," " sometimes making clean sweep of the whole," &c. He estimates the loss in 1865 at 1,00,000.

14*th*.—The secretion of milk is quickly arrested.

The *spasmodic symptoms* in this disease are very strongly marked from the commencement to the end: they are described as tremors of the muscles, and spasmodic twitchings of the voluntary muscles of the neck, shoulders and hind quarters. They pass off a few hours before death.

3. The preceding symptoms having lasted about 24 hours, diarrhœa sets in followed by dysentery. The evacuations are said to be slimy, liquid of a dirty yellow color, occasionally tinged with blood and tenesmus is described. The general symptoms now change. The fever passes away, the animal becomes cold, the extremities and spine being paticularly so. The pulse disappears and breathing becomes short, quick, and painful. The discharges from nose and mouth become purulent, the fæces more offensive. Prostration rapidly gains, the animal lies down, twitching stops, and death speedily ensues.

The duration of this disease is stated to be from 12 hours to 5 or 6 days, and rarely 8 or 9: the percentage of deaths to seizures being 90.

I append a tabular detail of the symptoms of Khorah, Gootee, Puschima, and Rinderpest for the purposes of comparison.

It is to be remarked that no mention is made of swelling of the throat in either account of the latter disease. It is also to be noted that this symptom is not described by Mr. Rutherford in the Calcutta Epizootic, nor by Mr. Lambert in the Ceylon disease, though almost all other accounts of Puschima distinctly allude to it.

Comparative view of the symptoms of "Khorah," "Gootee," "Puschima," and "Rinderpest."

Stages and symptoms.	Foot and mouth disease, Khorah.	Gootee.	Puschima.	Rinderpest.
Period of incubation...	36 hours ...	Not known ...	A few days, 2 ...	Seven to fourteen days.
I.—Premonitory stage	None described ...	Dulness and listlessness in action; dry and rough skin; short dry cough failing in milk.	Dulness and listlessness, refusal of food, failing in milk, restlessness, neglect of calf.	Suspension of rumination, want of appetite, staring coat, failing in milk.
Duration ...	.....	Lasts two to four days ...	Not noted ...	Not noted.
II.—Febrile stage				
Shivering ...	In some cases ...	In most cases ...	In some cases ...	In most cases.
Fever ...	Slight in most cases.	Severe ...	Remittent ...	Low type.
Temperature ...	Elevated ...	Much elevated ...	Elevated ...	Elevation but variable and transitory.
Skin ...	Rough, hot, and dry	Hot and rough horripilatio,	Hot and dry or clammy, horripilatio.	Hot and cold alternately horripilatio.
Pulse ...	Not noted ...	Increased ...	Accelerated ...	Accelerated.
Respiration ...	Ditto ...	Accelerated ...	Ditto ...	Short and quick.
Appetite ...	Bad ...	Lost ...	Lost ...	Lost.
Rumination ...	Suspended ...	Absent ...	Absent ...	Absent.
Thirst ...	Increased ...	Intense ...	Accounts vary ...	Accounts vary.
Eyes ...	Water ...	Inflamed and water ...	Inflamed and water ...	Inflamed and water.
Nostrils ...	.....	Viscid discharge ...	Viscid, fœtid discharge ...	Viscid, fœtid discharge.
Mouth ...	Discharge from ...	Sticky discharge from, ulcers on lips sometimes.	Sticky fœtid discharge from, ulcers on lips occasionally.	Discharge from, fœtid, raw spots.
Muzzle ...	.....	Hot and dry ...	Hot and dry ...	Not noted.
Cough ...	None ...	Occasional, short and dry	Occasional, short and dry	Occasional.
Tongue ...	.....	Swollen covered with mucus.	Swollen, sometimes ulcerated at base.	Not noted.
Urine ...	High colored ...	Scanty and high colored	Scanty and high colored	Ditto.
Posture, &c. ...	.....	Head down, ears drooping, back up.	Head down, ears drooping, back up.	Head down, ears drooping, Back up.
Lactation ...	Diminished ...	Much diminished ...	Much diminished ...	Much diminished.
Spasms ...	Absent ...	Absent ...	Occasionally present ...	Always present.
Glandular swellings ...	None ...	In some epizootics ...	In some epizootics ...	None.
Duration ...	Not noted. ...	Two or three days ...	One or two days ...	About 24 hours.
III.—Third stage, Eruption ...	Vesicular in clefts of hoofs, in mouth, and sometimes on other parts of body.	On udder, belly, between legs, sometimes all over body, vesicular.	None ...	None, exudation and cracks on skin.
Diarrhœa ...	Rare ...	Constant ...	Constant, fœtid ...	Constant, watery, and fœtid.
Dysentery ...	None ...	In most cases ...	In most cases ...	In most cases.
Fever ...	Subsides ...	Intermits ...	Becomes typhoid ...	Becomes typhoid.
Discharges ...	Disappear ...	Become purulent ...	Become purulent, fœtid or sanious	Become purulent.
Temperature ...	Normal ...	Diminished ...	Animal becomes cold ...	Animal becomes cold.
Lameness ...	Present ...	Occasional ...	None ...	None.
Emaciation ...	None or slight ...	Great ...	Very great ...	Extreme.
Prostration ...	None ...	Considerable ...	Severe ...	Ditto.
Throat ...	Normal ...	Occasionally swollen ...	Frequent swollen ...	Not swollen.
Spasms ...	None ...	None ...	In some cases ...	In all cases.
Duration ...	Not noted ...	Three or four days ...	Two or three days ...	24 to 36 hours.
Duration of disease	Eight or nine days ...	Five to ten days ...	Four days ...	Three or four days.
Mortality ...	Slight ...	60 to 90 per cent ...	90 to 100 per cent ...	90 per cent.

VII.—Post mortem appearances.

These are carefully and minutely detailed in the accompanying table, in which the appearances are noted almost in the words of the observers in a methodical form. From this record it will appear that there is a remarkable similarity between the morbid appearances noted in Gootee, Puschima, and Rinderpest. I have not been able to find any account of the dissection of a fatal case of "Khorah." The most important general inferences to be drawn from the table are—

1*st*.—That the most characteristic and severe morbid lesions are confined to the mucous membrane of the alimentary canal.

2*nd*.—That the respiratory mucous tract is affected in a less degree.

3*rd*.—That the glands in relation to diseased surfaces are diseased.

4*th*.—That the blood is altered in constitution.

5*th*.—That the skin is affected only in Gootee.

6*th*.—That the condition known as "Fardel bound" is frequently found in all these forms of disease, and

7*th*.—That no appreciable lesion of the nervous centres is detected except in Rinderpest, in which an excess of fluid is described. Mr. Gudgin also found this appearance very uniformly in his *post mortems* in Burmah.(1)

(1) XXXVI.

8*th*.—This gentleman has also described a specific lesion of the small intestines at the site of the solitary glands and peyers patche's. He describes "a yellowish exudation of the consistence of inspissated pus, and varying from one-eighth to two-eighths of an inch in thickness. On removing this deposit the tissue underneath showed points of ulceration with a margin of a bright red color." In the large intestine he also found patches of exudation and abrasion. The latter appearance I observed in Gootee, and in the small intestines I found the solitary glands enlarged and distended with secretion.

These appearances denote a similar but stronger eliminatory action in and near the glands of the intestines than what is observed in typhoid fever when the specific lesion is more a growth than an exudation.

The phenomena more resemble the morbid appearances in specific dysentery than in typhoid fever.

VIII.—Pathology.

The diseases which have been considered in the preceding sections would come under the class of *Zymptic diseases*, order *miasmatics* in the present scheme of classification of human diseases. Their essential nature is expressed summarily in the following definition.

After an interval of longer or shorter duration has elapsed between the exposure to the specific cause of the disease and the appearance of its symptoms, certain phenomena indicating general disorder of health appear. These having lasted from a few hours to a few days are succeeded by a febrile condition of the body, which varies in degree and type according to the form of disease and general character of the epidemic, and is revealed by increase of temperature and certain definite disturbances of the functions of the body.

After this condition has prevailed for some time, certain specific lesions of the mucous or cutaneous surfaces or both are manifested, in some cases accompanied by affections of the lymphatic glands in relation to these.

The constitutional symptoms now undergo a change, and within a certain time a fatal result from general exhaustion, or the development of some special complication, or an improvement in the character of the symptoms presaging recovery, takes place.

What the origin or nature of the poison producing the specific symptoms in these several diseases is, we are quite ignorant. Whether it is the same poison in different degrees of intensity or different poisons, we are equally unable to say. Their very existence is hypothetical, and is presumed from the character of the symptoms. The utmost we can say is that, from the fact of their being intensified by certain unsanitary conditions, and capable of being conveyed from one animal to another and from one locality to another, there is a strong presumption of their existence, as substances capable when brought into relation with an animal of causing the disease. From the rapidity of the spread of the disease(1) we infer that they are very subtile and diffusible and most probably capable of being conveyed by atmospheric influences.* Their comparative virulence is inferred from the kind of re-action which ensues on their introduction into the body. Thus the poison causing "Khorah," and cow-pox proper, is in the great majority of cases mild, producing no sudden or striking nervous re-action, involving little or no change or vitiation of the functions of the body, stimulating little or no destructive tissue changes, interfering to a very slight extent with secretions and quietly working out its own elimination through the channel which for an inscrutable reason it selects. The poison of "Gootee" is reckoned to be more pernicious, because the re-action is more severe. The nervous system is primarily attacked, and general dulness, uneasiness, and shivering evidence the poisoning agency. The functions are gravely involved tissue change of a destructive character is soon initiated; secretions become depraved, and the elimination of the poison from its seats of selection is accompanied by violent local action; inflammation in all cases, abrasion and ulceration in many, and erysipelatous gangrene in some.

(1) XXVIII., XVIII. 1.

In "Puschima" and "Rinderpest" we have the extreme of virulence. In these diseases the action on the nervous system is so pernicious that poisoning may ensue at once without the development of any other organic disturbance.

When these, however, ensue, their severity, their rapidity, and their fatality are most marked, and contrast strongly with the other diseases.

On comparing the diseases described under the names of "Khorah," "Gootee," "Puschima," and "Rinderpest" with each other, a remarkable sequence is disclosed, so much so, that from the mildest case of "Khorah" without any constitutional symptoms and a very slight eruption up to the most severe case of "Rinderpest," a continuous series of morbid phenomena seems to run; the whole forming a natural group or succession of diseases with "Khorah" at one end and "Rinderpest" at other. On the borders of each we may find cases which it will be difficult to know where to place, but from the general run of cases in an epizootic, the character of the disease is declared. Thus we may find a case of "Khorah" with severe constitutional symptoms, and general vesicular eruption which in an epizootic of "Gootee" we should call by that name or a case of "Gootee" with the mouth and foot lesions peculiar to "Khorah" which, unless the general run of cases were undoubtedly "Gootee,"

* After writing the foregoing I received Mr. Gudgin, Veterinary Surgeon's Report on Cattle Disease in British Burmah. I have much pleasure in transcribing his remarks on "the nature of the disease" (Puschima) as quite coinciding with and confirming my own.

"This disease is a malignant and infectious fever of a typhoid character, attacking the mucous membranes of the body. It is analogous to or identical with the "Rinderpest" now raging in England (1866). It exhibits the same symptoms, attacks the same structures, runs its course in the same period, is characterized by the same amount of mortality, and displays the same *post mortem* lesions.

"The membranes lining the air passages are always more or less affected, but the morbid lesions, so distinctive of the disease and so destructive to life, are found in the fourth stomach and large and small intestines. During the progress of the disease a specific disease poison is generated, which the system endeavours to throw off by the intestines. The excretions including the exhalations from the skin contain a subtile and virulent poison, capable of infecting other cattle (and probably all ruminating animals) if brought either by inhalation or direct contact with the mucous membranes of the body. There is little doubt that the poison contained in the exhalations from the skin and the alvine evacuations is diffused through the air to a considerable distance, and in a sufficiently concentrated form to infect other cattle. That it is infectious is proved by the history of outbreaks and confirmed by the testimony of the inhabitants of scores of villagers, whose observations have extended over a series of outbreaks of the disease." XXXVI. p. 9.

we should call "Khorah." In an epizootic of "Gootee" we may find cases without any cutaneous eruption and with the glandular enlargements characteristic of "Puschima," and in the latter we may detect the typhoid or algide phenomena, the absence of glandular enlargements, and the presence of spasms.* As we ascend this series, the prominence of the skin eruption disappears, the severity of the diarrhœic phenomena increases. Glandular implications appear and then disappear, nervous phenomena become more marked and specific, putridity increases, the stages shorten, the type of fever degenerates, and the rate of mortality becomes greater.

There are also certain epizootics linking together the various diseases. Epizootics which may be called by one or the other name. The best example of this is the Assam epizootic which stands half way between Gootee and Puschima. A superficial account of this epizootic induced Dr. Palmer to place it in the same category as the "Calcutta epizootic,"(1) yet a perusal of Dr. Long's careful observations will convince that it was Gootee.(2) It is difficult to say whether the epizootic in the Cossyah Hills described by Lieutenant-Colonel Hopkinson(3) was Khorah or Gootee, and in other instances mention is made of epizootics with an intermediate mortality or occasional eruptions.

(1) X., p. 5.

(2) XXIX.

(3) XII.

This view is further strengthened by the history of excema epizootica and vaccinia in England. The epizootic of 1839 of the former disease was more virulent and fatal than subsequent manifestations,(4) and the epizootics of 1745 and 1770 of the latter disease were so malignant and fatal as to attract the attention of Parliament,(5) though both diseases have recently been mild and comparatively harmless. Again a very important observation is recorded by Dr. Aitken,(6) as to ovine variola showing the unimportant nature of a cutaneous eruption as a pathognomonic feature. He says "the virulent form" of ovine variola "never produces pustules." He describes the skin cracking in a zigzag manner, and in Rinderpest cracks and sores of the skin are also observed.(7)

(4) XXX., p. 84.

(5) XXXI., p. 267.

(6) XXXI., p. 272.

(7) X., p. 7.

A careful comparison of the symptoms and *post mortem* appearances of the diseases in question which have been summarized and stated without regard to any theory will be found to speak strongly in favor of this view, which appears to be the most reasonable and probable under the circumstances. Still as the degree of the symptoms is various and the mortality of the diseases so different, it is well that they should be kept apart, at any rate as different varieties: they resemble each other more than any one of them resembles any other disease of man or other animals, but at the same time they present differences which have been recognized by unprofessional and unskilled observers sufficient to justify their being described and still remaining apart as different diseases.

Comparative Pathology.—I shall now under this heading proceed to compare the salient points of these diseases with others, in order, if possible, to determine their position in a scheme of comparative nosology, a subject which is as yet in its infancy.

Khorah and Cow-pox.—These diseases differ in the specific site of the eruption, in the specific nature of the eruption, in duration of the stages, and in the changes to which the eruption on the skinis is subject. Even the general eruption on the skin is different in the time of its appearance and the sequence of its changes.

The two diseases are evidently different species of miasmatic epizootic diseases.

Gootee and Cow-pox.—The greater severity of the constitutional symptoms of the former, the difference of the dates of appearance of the stages, the difference of the kind of eruption and its changes, the presence of diarrhœa followed by dysentery in Gootee and its absence in cow-pox, and the distinct character of the general eruption of the latter, separate these two diseases, whose only resemblance is the existence of an eruption and the presence of constitutional disturbance of a somewhat similar nature. They come under the same order, but are evidently different genera of disease.

Dr. Aitken talks of *spurious* forms of cow-pox, whose nature he does not describe.(8)

(8) XXXI., p. 274.

Gootee and Small-pox.—These diseases present remarkable analogies. The general course of the disease, the duration of the stages and of the diseases itself; the salivation, the discharge from the eyes, the occasional diarrhœa, the sore throat, and the occasional involvement of the respiratory mucous tract present a group of striking resemblances.

On the other hand, the character of the eruption is different, the secondary fever is not described in Gootee, the latter disease is more "putrid" and the diarrhœa, which is succeeded by dysentery, more invariable. The diseases present strong analogies, but evidence is still wanting to establish their identity. None of the reports hint at the infection of man by

* The history of a recent epizootic in Assam strongly confirms this view. In this epizootic cases presenting all the phenomena of Puschima occurred. The symptoms of these are summarized by Dr. Imthurn as "numerous watery evacuations, prostration, death." Another describer of the same epizootic (Mr. Driberg states that "in many cases an eruption called Bossunt breaks out on the body." He also, under the name of soboka, alludes to what is evidently foot and mouth disease. From Major Lamb's letter there is some presumption that Puschima appeared at the commencement of the epizootic, and that subsequently "it assumed a quite different form," namely, Gootee. XXXV., 1, 2, 3.

Gootee or the infection of animals by small-pox, nor even of the simultaneous prevalence of these diseases. Moreover, when cattle have been infected by human small-pox, the disease goes through the characteristic stages of cow-pox.(1)

(1) XXXI., p. 271.

Puschima and Gootee and Plague.

Between the forms of Puschima and Gootee in which there is grandular enlargement and plague there are many analogies. The circumstances of country and climate in which these diseases respectively flourish, are similar *viz.*, deltas; low, crowded, badly ventilated dwellings; a moist warm atmosphere, the action of putrescent animal and vegetable matters, and insufficient and unwholesome food.(2) The season of year in which they respectively flourish (December to June) is the same.(3) The sequence and duration of stages are very nearly alike. The glandular lesions are very similar, only that in man the inguinal glands are more prone to be enlarged: the type of the fever, the rapidity of spread, the mortality, the state of the blood are strongly analogous. In both there is a tendency to specific cutaneous lesions. Both may kill without the manifestation of any local lesion; both appear to be endemic diseases capable of becoming epidemic; both are considered highly infectious, and in plague as well as Gootee and Puschima, the characteristic secondary lesions may be suppressed, in other words, epidemics or epizootics which possess marked general similarities differ from each other in the kind and degree of local specific manifestations.

(2) XXXIII., p. 328.

(3) XXXII., p. 371.

There is an interesting observation by Dr. Milroy(4) to the effect that an epidemic of plague in Bughazi was preceded for two or three years by a virulent epizootic among cattle.

(4) XXXIII., p. 329.

There are important differences also, namely, the more hœmorrhagic character of plague, the diarrhœa and dysentery and Puschima and Gootee, which are not recorded of plague, the nature of the cutaneous lesion when it exists in plague most commonly carbuncular, and the enlargement of the heart, liver, and spleen observed in plague. It is, however, to be noted that Dr. Long in Assam observed a very similar state of spleen to that recorded by writers on plague. The diseases are evidently closely allied though they present specific differences.

Puschima and Gootee and acute Glanders.

The principal analogy between these diseases consists in the enlargement of the glands of the neck in each and the discharge from the nostrils. They differ, however, materially in general course and symptoms, in the kind of cutaneous eruption and in the *post mortem* appearances. They are evidently different genera of disease, though both exemplifying the general miasmatic type.

Puschima and Cholera Morbus.

The comparison here is between the more sudden virulent and algide forms of Puschima without glandular enlargements (such as occurred in Ceylon, Calcutta, and Darjeeling), and cholera. The main points of resemblance are—

1*st.*—The liability to death following close on the first manifestation of symptoms.

2*nd.*—The algide phenomena.

3*rd.*—The profuse watery discharge.

4*th.*—The muscular spasms.

5*th.*—The co-existence of the two forms of disease in one locality and—

6*th.*—To a certain extent the state of the blood and *post mortem* appearances.

1*st.*—The algide stage of cholera precedes the febrile, while in Puschima it is the reverse.

2*nd.*—The discharges in cholera appear before or consentaneously with constitutional symptoms, while in Puschima constitutional symptoms precede the manifestation of any local action.

3*rd.*—Vomiting is an essential feature of cholera not so of Puschima.

4*th*—Tenesmus is absent in cholera, but is described invariably in Puschima, and—

5*th.*—Discharge of blood from the bowels is an invariable symptom of Puschima, if the case is developed and the animal live long enough, not so of cholera. These are important differences and militate gainst the opinion entertained and expressed by some that they are the same disease manifested through different channels.(5)*

(5) XV.

Puschima and Typhoid Fever.

The resemblances are—

1*st.*—The character of the Fever.

2*nd.*—The Diarrhœa.

3*rd.*—The *post mortem* lesions to a certain extent.

The differences are—

1*st.*—The duration of the whole disease and its stages.

2*nd.*—The skin eruption in typhoid and its absence in Puschima.

† Mr. Cockburn under the name of "Bhall" describes a disease which appears to be identical with cholera.

3*rd*.—The dysentery in Puschima while it is only spurious in typhoid.

4*th*.—The specific intestinal lesion in typhoid involves primarily the solitary and agminated glands in a process of cell growth followed by ulceration. Other intestinal lesions are secondary and non-essential, while the intestinal lesion in Puschima is a general disease of the whole mucous membrane, of which any glandular phenomena are only a part.

5*th*.—The febrile phenomena in Puschima are more evanescent than in typhoid.

These differences separate the diseases to a considerable distance.

Gootee and Distemper of Dogs.

These diseases present very many and striking resemblances. They are both infectious miasmatic diseases, presenting similar stages of very similar duration. In both the fever is of a typhous character. In both the alimentary mucous membrane is mainly affected and other mucous membranes secondarily, causing diarrhœa succeeded by dysentery. In both there is a skin disease, and individual symptoms such as water running from eyes and nose, cough, &c., are remarkably alike. I have not been able to obtain a very exact description of distemper, but the analogies above noted derived from a study of "Stonehenge's" chapter on the subject(1) are interesting and suggest further study.

(1) XXXIV., p. 614.

The foregoing sketches go to show that while the diseases under consideration possess many striking resemblances to others when particular symptoms are considered, they are essentially suigeneris, when a broad view of the whole detail and sequence of symptoms is taken and resemble each other more than they resemble any other disease or group of diseases.

IX.—Diagnosis.

From the minute description which has been given in Section VI. of the symptoms of Khorah, Gootee, and Puschima, there can be no difficulty in distinguishing them from each other and from other diseases. The eruptive nature of the disease, the description of eruption, and the sites which it selects, are sufficiently characteristic of Khorah to separate it from all other diseases of the foot causing lameness. As, on account of its epizootic and infectious nature, it is of importance to determine its nature, the cleft of the foot and inside of the lip should always be examined, and if *vesicles* are found in these sites there can be no doubt of what the disease is. As Khorah for the purposes of treatment must necessitate animals being laid up for some time and so involve considerable loss of work, it is of great importance to diagnose it correctly. If my surmise that the poison causing it is a milder manifestation of the same poison which causes Gootee and Puschima is well founded, then the importance of recognising this disease and using measures to check its progress becomes still more pressing.

Every case of sore, swelled or ulcerated foot, is not necessarily Khorah, and in diagnosing the disease from others, the manifest infectiousness, the eruptions and soreness of the mouth should be taken into consideration. Between severe cases of Khorah, with well marked constitutional symptoms and general eruption, and cases of Gootee, it will be difficult to distinguish. Lameness, the comparative severity of the general symptoms and mortality, will perhaps define the disease, but for practical purposes an exact diagnosis of such cases is not of such importance.

As there is a difficulty in diagnosing between individual cases of cases of Khorah and Gootee, so there will often be a difficulty in distinguishing in some cases whether they are instances of Gootee or Puschima. The distinction is to be drawn more from the general peculiarity of the particular epizootic than from the symptoms presented by any one case.

The main differences between the two diseases are—

1*st*.—The presence of a skin eruption in Gootee and its absence in Puschima.

2*nd*.—The lower type of fever, and greater tendency to prostration in Puschima than in Gootee.

3*rd*.—The earlier and more marked fœtor of the discharges in Puschima than in Gootee.

4*th*.—The shorter duration of the stages and of the whole disease and earlier appearance of diarrhœa in Puschima.

5*th*.—The more frequent occurrence of glandular swellings in the neck in Puschima than in Gootee.

6*th*.—The presence of spasmodic phenomena in puschima and their absence in Gootee; and

7*th*.—The higher mortality of Puschima than Gootee.

Between the severer form of Puschima as described by Mr. Rutherford and Rinderpest, there is very little difference, as will appear from a study of the table exhibiting their symptoms comparatively.

The spasmodic phenomena appear to be more severe and better marked in Rinderpest, and the febrile symptoms are of a lower type and more evanescent in that disease.

X.—Prognosis.

In *Khorak*, if proper care be taken and proper measures of treatment employed, the diagnosis is always good.(1) It is a mere local disease, requiring time and attention for its complete cure.

(1) XXII. XVIII., 1.

If any of the complications already enumerated are allowed to appear, the case becomes more likely to prove fatal.

If constitutional symptoms of any severity mark the epizootic, a certain proportion of deaths, not more than 25 per cent., may be looked for.

In *Gootes* a large proportion of deaths must always be looked for. As to individual cases the symptoms which would lead to an unfavorable prognosis are:—

1*st.*—Low type of fever.
2*nd.*—Early prostration.
3*rd.*—Early fœtor of discharges and early diarrhœa.
4*th.*—Scanty or no eruption.
5*th.*—When ulcers exist an unhealthy appearance of these.
6*th.*—Prolonged aversion to food and violent thirst.
7*th.*—Tight shrivelled skin.
8*th.*—Scanty and very red urine.
9*th.*—Early recumbency.
10*th.*—The occurrence of any complication.

In favorable cases the following presages may be noted—

1*st.*—Mild fever of asthenic type.
2*nd.*—Relaxed skin and copious eruption.
3*rd.*—Clear discharges from eyes, nose, and mouth, void of fœtor or with a slight smell.
4*th.*—Bowels quiet.
5*th.*—Urine abundant and not of a very high color.
6*th.*—Return of appetite, of rumination, and slight thirst.
7*th*—Healthy ulcers if they exist.
8*th.*—Absence of complications. Of all these signs perhaps the most significant and that most usually noted is return of appetite and rumination.

In *Puschima* at the commencement of an epizootic, a mortality of at least 90 per cent. may be looked for, later it may diminish to 50 per cent. Each individual case should however obtain the benefit of treatment, and by pursuing the plan which experience and analogy suggest as the most likely to do good, by watching the case carefully and taking advantage of every favorable opportunity, many cows which would otherwise die may be saved.

The unfavorable signs in this disease are, early cold, fœtor, dysentery and recumbency. The earlier these occur the worse the case must look.

On the other hand, if the heat of the extremities and spine is sustained, if the fœtor is not great nor the discharges in an evident state of decomposition, if the diarrhœa does not come on till the third day and is not shortly followed up by dysentery, if the animal stands—is not compelled to lie down, then the case wears a more hopeful aspect.

Severe spasms, especially if they have any regularity or system, may also be looked on as bad signs and their absence as good omens.

In Mr. Greenhill's cases, recorded by Dr. Palmer(2) picking a little food and an improvement in the state of the bowels were the earliest observed signs of recovery. The state and expression of the eyes and general appearance of the animal will also serve as indications of the nature and prospects of the case.

(2) X. page 9.

XI.—Treatment.

This subject may be considered under three heads—

1*st.*—The avoidance of conditions which would render cattle more liable to be attacked by epizootics.

2*nd.*—The means which ought to be pursued to prevent the spread of epizootics when they appear in a locality or nighbourhood.

3*rd.*—The medicines and modes of medical treatment which should be applied in the several forms of disease under discussion.

1. In every epidemic and epizootic, it is the poor, the diseased, the filthy, and the overcrowded which most early and most surely succumb to the influence.

At all times, then, cattle ought to be kept up to the greatest standard of health and comfort possible under the circumstances.

(a.) The quality of the stock should be sustained and improved—

I.—Avoiding breeding in and in, that is, allowing near relations to have sexual connection and to propagate the kind.

II.—Preventing too young bulls from covering.

III.—Obtaining bulls from a different locality and of a good stock.

IV.—Breeding should be adopted and encouraged as much as possible in preference to buying and selling, which greatly increases facilities for the spread of epizootic diseases.

(b.) Animals should not be set to work too soon, nor cows allowed to have calves too early.

(c.) Great care should be taken not to overwork cattle.*

(d.) They should not be crowded in small confined barees, and these ought to be dry, clean, and well ventilated.† The situation of cattle sheds should be carefully selected to avoid damp and malaria.

A raised bamboo machan covered with straw ought to be provided in *bheels* and damp places, when cattle are removed from the baree to plough or assist in gathering in.

(e.) When they get wet with water or perspiration they should be rubbed dry.

(f.) The food and drink must be carefully looked to.

Early rain grass, after the cattle have been used to dry food, is very injurious. Malarious pastures, coarse grasses, and old straw are very injurious, and the muddy water of bheels and foul tanks should never be given as drink.(1). Green grass (except at the beginning of the rains) when it can be obtained, short dry pasturage, and wholesome hay and rice straw should be given as food.‡ The heart of the plantain tree or young plantain leaves chopped fine and small, boiled or broiled;(2) gram and boossie, paddy or oil cake, if they can be afforded can also be given in small quantities as aids to other coarser fare. Good tank, river, or well water should be supplied for drink with the same regard to their quality as if they were intended for man.

(1) XXXVI., p. 3.

(2) VI.

2. When an epizootic threatens cattle should be especially looked after. The greatest care should be taken not to permit the access of a diseased animal or of an animal from a diseased neighborhood. The propriety of this caution is evident from the instances mentioned by the Magistrate of Backergunge already cited. Mr. Lambert writing of the Ceylon epizootic, says, "the immunity" from disease prevailing in the neighbourhood "enjoyed upon this estate was attributed to the nature of the food, *to the absolute isolation in which the stock was kept*, and to the care bestowed upon them."(3) The feeding, housing, and general care of the animals should be more solicitously looked to than ever.

(3) *See* also X., p. 12, to the same effect.

Cattle should be carefully kept away from roads and routes frequented by cattle travelling from one district to another.

Buying and selling should be suspended or prohibited, and if any cattle are bought, they should be kept away from the others for at least twenty days.

Intercourse of all kind with affected villages should be as limited as possible, and if the disease come into the immediate neighbourhood, temporary hospitals should be constructed for sick cattle in out-of-the-way places.

Inquiries should also be instituted as to the approach and direction of spread of the disease and means adopted to avoid it.(4) There is reason to believe that if one diseased animal frequent a pasturage, it becomes a source of infection, and this should be held in mind.

(4) XXXVI., p. 27.

3. When the disease actually breaks out, the diseased animals should be separated from the healthy, and the latter removed to some locality where no disease exists, and if disease still appears, the process should be repeated until no more cases occur(5). Mr. Caleb Ladd describes the measures which, at the suggestion of a Veterinary Surgeon, he adopted on the appearance of Pusehima on his farm. He removed all the diseased animals, burnt all the old straw and manure about the cow house, all the straw in the house and the house itself. He then removed all the unattacked animals to a new house on the other side of his garden and the plague was stayed. Mr. Ladd remarks that if these precautions, namely, removing all the stock as soon as one is attacked, and if the diseases follows, removing to another place and burning the refuse of each place, were adopted in every instance, he thinks the disease would altogether disappear.(6)

(5) XXIX.

(6) VIII., para. 7.

Mr. Sawers says that the disease, Gootee, appeared among a herd of forty-six of his buffaloes, of which two were attacked. He remarks,—"I immediately detached these two and removed the entire herd from the locality; only one more case occurred."(7)§

(7) VIII., 2.

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* And not to work them too long without food. Cattle are apt to injure themselves by surfeit when not fed at proper intervals.

† The sheds should be cleaned daily. The floor should be of dry earth well pressed down (XXXVI., p. 2.), or still better, pucca, sloping on either side in order to allow water or urine to drain away. Dry grass or straw should be given for a litter.

‡ This should be chopped up and given with water. The addition of a little salt renders the mash more wholesome.

§ To these may be added two instances recorded by Veterinary Surgeon J. P. Gudgin in Burmah. In one village after suffering severely from the disease, the inhabitants sent the remaining cattle to a jungle seventeen miles away and the disease disappeared. In another case the plan adopted was that the sick were separated from the healthy, and the latter sent miles away into the jungles. After doing this the disease died out.

Another case is very interesting. "*Swantay*, no disease here. In anticipation of being attacked they had sent their buffaloes to a grazing ground beyond a range of hills, about ten miles off." XXXVI., page 8.

With these instances of success in support of the propriety of this measure, it should invariably be resorted to.

In some places, indeed, it is invariably adopted(1), and its importance cannot be overrated. Whenever therefore, when an epizootic is known to rage in the neighbourhood of a locality, any cow is noticed to look ill and be off its feed, it should be at once removed, and the rest of the herd sent elewhere.* The Civil Surgeon of Backergunge recommends cattle sheds to be well cleaned out and large smoking fires lighted daily for an hour or two(2). I am convinced, however, the safest plan is to burn the whole concern(3), and that in most cases involves very little loss. If the place is pucca then it should be carefully cleaned and fumigated in the manner described and not used again for three months at least.(4) I shall here transcribe Dr. Palmer's excellent sanitary directions. He writes, "prompt and complete separation of the healthy from the affected or suspected cattle is to be enforced.* * * When it is practicable to remove the unaffected cattle, we believe this proceeding the more likely to be successful in checking the disease. * * * Straw, dung, hay, trough and such like should be removed, burnt, and disinfected; the stall in which the animal stood should not be used again, but thoroughly cleansed out and disinfected. * * * *All animals dying should be buried without a moment's delay, not skinned,* and no animals should be allowed to approach the burial ground until some time has elapsed since the last interment."(5)

(1) XXXV., 3.
(2) XIII., 1.
(3) XXXVII., p. 2.
(4) X., p. 4.
(5) X., p. 12.

This last direction is of the utmost importance. When we consider that the animal body, diseased or dead, contains material sufficient, under favoring circumstances, to infect many others, the greatest possible care in neutralising and removing this source of disease is imperative. All traffic in hides should be carefully abstained from.

Dr. Palmer recommends the use of McDougall's disinfecting powder, but in its absence quick lime may be employed, not as a mere cover for impurities, but as an agent that may destroy any organic residue which may have escaped careful cleansing.

The question of *inoculation* has still to be decided by experiment, though at present presumptions are rather against than for it.

As the diseases are quite different from cow-pox, notwithstanding Professor Symond's opinion, as to their ariolous nature, vaccination would, in Gootee and Puschima, in all probability, be perfectly useless. This has been determined in England by experiment.

The only question is whether, if the cattle of this country generally were inoculated with the contents of the vesicles of Gootee or the salivary discharge, tears, or serum of the blood of Puschima, a saving of stock would be effected on the whole.

Two indisputable facts are in favor of this measure.

1*st*.—That an inoculable disease poison when admitted into the body through the skin does not produce such a severe sequence of symptoms as when absorbed by mucous membranes.

2*nd*.—That a modified form of disease can be obtained by successive inoculations from animal to animal.

This has been extensively demonstrated by experiment, and the experience of vaccination from man to man confirms the truth of the statement.(6)

(6) XXXIII., p. 506.

The subject is now under investigation and experiment in Europe. Inoculation has been practiced on a large scale with the Rinderpest poison in the Steppes of Russia "its home," with the result that only a trifling percentage of cases have died, and the animals subjected to the process though exposed to every source of infection have not again contracted the disease.

Beyond the Steppes results have not been so favorable, and it has been found necessary to subject 13 to 15 animals to inoculations successively ere the virulence of the poison was sufficiently reduced, and the rate of mortality brought down to a mall percentage,(7) in other words, in the technical language of inoculators, "in other races of cattle the virus must pass through 13 to 15 generations before inoculatory matter that produces a mild form of disease is obtained."

(7) XXXVI., p. 16.

If the operation is to be tried in this country the following precautions are indispensable:—

1. The proceedings must be under the control and strict supervision of a professional man.

2. They ought to be conducted apart from where healthy cattle might be infected.

3. The virus must be primarily obtained from a mild case of the disease, Gootee or Puschima.

4. A sufficient number of animals must be successively inoculated until the symptoms ome mild.

5. When the requisite degree of modification has been reached, cautious trials should be made at first on a limited scale.

* A yard's separation as in some cases in Burmah is not enough. The separation must be measured by miles, and it is well to split large herds up into smaller sections. (XXXVI., p. 6

6. Goats and sheep should also be subjected to inoculation, with a hope that mitigation of the virulence of the poison may be more rapidly and completely accomplished by that means.

These proceedings cannot obviously be left to private zeal or interest. To carry them out thoroughly and properly, demands an expenditure and resources which no private individual can command.

The losses occasioned yearly by cattle diseases have become a matter of imperial solicitude and interest. A successful solution of the propriety and power of inoculation can only be accomplished by direct imperial action.

The end to be attained is at the cost of a trifling mortality of one or two per cent. to protect all the cattle of the country, against a disease that carries off 80 to 90 per cent. wherever it appears. Evidence from many quarters tends to show that virulent epizootic visitations are becoming more and more frequent, and that often agriculture, which is the very life of the country, is paralysed by these outbreaks.

The time has come when the matter must be looked full in the face. I am convinced that mere written directions are as unavailing in this matter as in the matter of human vaccination, and that a comparison of the cost of yearly losses by cattle disease and the cost of a well devised set of experiments to test the question of the practicability and protective power of inoculation, and perhaps eventually of machinery to apply, throughout the country this protective power, will show a balance in favor of the latter. The subject is a highly important one in many respects, and appears to be gradually forcing itself more and more into such a position that something *must* be *done*.

In dismissing this subject, I would enter a strong caution against the fancied resemblance between Gootee and Cow-pox inducing any one to attempt inoculating man with the matter of the Gootee vesicle, a proceeding which had caused the death of the individual experimented on.

3. The medicinal treatment will be more instructively given under the head of each disease separately.

(a.) Khorah.—In mild cases the treatment is almost purely local. The simplest treatment recommended and employed for this disease is keeping the animal standing for several days in soft mud.(1) This is said to be a very efficacious mode of treatment, and is that generally employed by the natives. It has the advantage of effectually warding off flies, the source of one of the worst and most fatal complications and so tends to limit the mortality. If this method is employed it must be carried out carefully and completely.

(1) VI. XV., XVIII., 1. XXII. XXIII. XXXV., 3.

If the mouth becomes sore, the best application is—

Alum	...	...	...	1 ounce.
Water	...	...	...	1 quart.

To be applied with a sponge or cloth, thrice a day.

The foregoing may be called the *wet cure*. It is principally employed in, if not peculiar to India, elsewhere *dry method* are pursued.

The feet are well washed. The animal is kept carefully from moisture, and tar, Kurrunj oil, (2) camphor and oil, (4) (as much camphor as will dissolve in hot oil) sulphate of copper (2 ounces, treacle (goor) 8 ounces, to be heated till the substance assumes a red color,) &c., applied.

(2) XV., 1. (3) XXII.

If constitutional symptoms are severe, a saline purge should be administered such as—

Epsom salts	...	...	...	8 ounces.
Common salt	...	...	...	8 „
Ginger	...	...	...	2 „
Water	...	...	...	1 quart.

If febrile symptoms continue, the following may be given—

Black antimony	...	...	...	2 drams.
Black salt		...	...	3 „
Nitre	...	...	...	2 „
Water	...	...	...	1 pint.

To be given twice a day. (4)

(4) XIII., p. 1.

Complications require special treatment.

1. Ulcers on the mouth or udder are to be treated with the alum lotion already given or sprinkled over with desiccated alum (alum pulverised by heat which drives off some of the water in combination with it). This is best done by holding it over a flame in a spoon or similar receptacle.

2. Ulceration of the foot and destruction of the horny matter is best treated by scrupulous cleanliness, paring off shreds of horn, poulticing and the application of the sulphate of copper in substance, if the ulcer is foul and fungating, or in liniment according to the formula already noted. If the ulcer is deep and unhealthy looking, strong nitric acid should be applied with lint, followed by poultice and lotion of sulphate of zinc (5 grains

to the ounce) or sulphate of copper (10 grains to the ounce): neem or indigo water may be used in this stage. To ulcers of the mouth a lotion of nitrate of silver (grains ii. iv. to 1 ounce) is a good application.

3. The development of maggots is better prevented by the use of the means already indicated than cured. If they do appear they should be carefully extracted. Yellow wash (corrosive sublimate grains 4 to 1 ounce of lime water) should be applied till the ulcer become healthy, and then some of the weaker astringent lotions. Scrupulous cleanliness and the careful protection of the ulcerated surfaces by cloths and bandages are necessary. Corrosive sublimate may be applied as a powder well diluted with flower or chalk. Diet in this disease should be simple and nutritious.

8. *Gootee.*—In treating this disease general remedies are of primary importance and local remedies secondary, the latter will be very much the same as those indicated under Khorah according to the symptoms presented. When I add that sponging the surface over frequently with warm water, or warm vinegar and water during the second stage, will materially assist the development of the eruption and the cure of the disease. I have said all that is necessary on this head.

Two special modes of treatment which have been confidently recommended in this disease first demand attention. The earliest is that of Mr. Piddington, (1) who recommends separating the dull cattle from the healthy on the appearance of an epizootic, and subjecting both separately to the vapor of muriatic acid. He describes the process thus:—"In a stable containing 30 or 40 head of cattle, a plate full of warm salt is placed upon a few hot embers in an earthenware dish. Over this is poured about an ounce of concentrated sulphuric acid. A thick white smoke, which is highly pungent and suffocating, instantly arises, and the operator must carefully avoid breathing this, for it may occasion spitting of blood or even disease of the lungs. He should quit the stable immediately, shutting the door close. The windows, &c., must have been closed beforehand, the cattle will take refuge at the end of the stable and much coughing will be heard amongst them. The stable may be kept closed for 8 or 10 minutes or even more if there is not much coughing heard. This process is repeated in the evening and so on for three or four successive days.

(1) XXVI.

This measure, he asserts, has constantly stopped the disease among his cattle. It is simple, inexpensive, and should certainly be put in practice when a suitable place can be found.

The other special method of treatment is that recommended by Captain Chambers, Assistant Commissary General at Dinapore, (2) who states that according to his experience the black salt (karee neemuck or lobun) of the bazaar is an "infallible specific in this disease." The dose to be employed is one ounce (half chittack) twice a day in cases of the disease, and when the disease breaks out in a flock, he advises ¼ to ½ an ounce to be given daily to all the cattle as a preventive. He says that when fairly tried he has never found this remedy fail, and adduces a striking instance communicated to him by a planter who had lost forty bullocks of a herd of eighty, and after commencing to employ the karee neemuck did not lose another animal. He also states the addition of tartar emetic (sixty grains to one ounce of karee neemuck) improves its action. This mode of treatment should certainly be tried and its efficacy put rigidly to the test of experiment.* The foregoing methods are probably equally applicable in Gootee and Puschima, and may be tried in both. It is not clear from the papers referred to in what form of disease they were found useful, and it still remains to determine their exact value and place. There is an almost utter want of experience on this subject, and any plan offering a fair chance of success should be put in practice without hesitation, either until it is found wanting or another better method suggested or demonstrated.

(2) VII., 7.

The treatment which has been recommended most commonly, perhaps on the ground of analogy and probability, is the following:—

(*a.*) Saline purgation in the first stage.
(*b.*) Saline diaphoretics and diuretics in the second stage.
(*c.*) Astringents, tonics, carminatives, and stimulants in the third stage.
(*d*) Easily digested and nutritious food throughout the disease.

(*a.*) As a saline purge the formula already given under Khorah may be used, or common salt to the amount of 1 lb. to 2 lbs. may be given, or still better

Epsom salts	...	...	8 ounces.
Sulphur	...	...	4 „
Powdered ginger	...	...	1 „

Water, beer, gruel, or rice water, 1 quart to make a drench.

Saline purgatives are principally used in order to produce a copious and complete evacuation. This in the early stages of the disease may clear away the poison, or render the body, by having its excretory channels stimulated, more capable of voiding the morbid material from the circulation. There is reason to believe, however, that saline purgatives act principally on the lower bowels, and if there is any cause for suspecting that the first or third stomachs are

* Here I ought to place the plan adopted by Dr. Jackson of Balasore successfully in four cases, namely, the application of croton seeds to the sides in order to excite profuse suppuration. XI., 2.

over distended with food, or to apprehend the caking of aliment in the latter, one or other of the following doses should be administered, the latter by preference.

Boiling water	...	..	..	16 ounces.
Aloes	...	..	..	2 „
Carbonate of soda	...	..	..	2 „
				Dissolve.

To 10 ounces of this add 10 ounces of Epsom salts and administer with beer or gruel.

Linseed oil	..	...	...	... 1 pint.
Croton „	..	...	...	... 10 drops.
Oil of turpentine	..	...	...	... 2 ounces.
				Mix.

These should be given slowly, especially the latter, as when so administered, it finds its way to the third stomach without entering the rumen or paunch.

(*b.*) During the second stage the following may be given:—

Antimony	...	...	...	1 drachm.
Nitrate of potash	...	...	...	4 drachms.
Black salt	...		...	4 „
Sulphur	...	...	...	1 ounce.
Beer, gruel, or rice water	...	...	...	1 quart.

to make a drench, which is to be given twice a day.

Sulphur determines to the skin and bowels, and in this disease fulfils the indications of nature.

(*c.*) In the third stage, camphor should be largely employed as a good stimulant, opium and bhang as a good sedative and astringent, gentian or cherretta as a good tonic, and ammonia, ginger, carraway or pepper as stimulants.

The following formulæ will be found useful:—

Camphor	..	..	..	.. 1 ounce.
Bhang	..	..	..	.. 4 ounces.
Carbonate of ammonia	..	..	..	.. 4 drachms.
Brandy or spirit	..	..	..	.. 1 pint.
Gruel, beer, &c., to	..	..	..	.. 1 quart.
				A drench.

To be repeated twice or thrice a day.(1)

(1) X., p. 11.

Camphor	...	...	... 2 drachms.
Gentian	...	...	... 2 ditto.
Opium	...	...	... 1 drachm.
In gruel	...	...	... 1 quart.

A drench, to be given twice a day, or

Camphor	...	...	... 2 drachms.
Cherretta	...	...	... 1 ounce.
Powered ginger or pepper	...	...	... 2 ounces.
In gruel, &c.	...	...	... 1 quart.

A drench, to be given twice a day.

Similar formulæ may be devised according to the symptoms presented or the means at disposal.

If a more decided astringent is indicated or desired, any of the following formulæ given by Dr. Bensley of Backergunge will be found useful.

Decoction of Indurjub made by boiling 8 ounces of the seed in 24 ounces of water for half an hour	...		4 ounces.
Chalk	...	...	... ½ ounce.
Opium	...	...	... 1 drachm.

Mix and give this as one dose.

Repeat every two or three hours according to purging.

Decoction of unripe bael, eight ounces of the fruit to twenty-four ounces of water	...	...	... 4 ounces.
Catechu	...	...	... ... drachms.
Opium	...	..	... 1 drachm.

To be given every two hours till purging is brought under control.

Gum	...	...	... 2 ounces.
Sulphate of copper	..	...	... 2 drachms.
Water	...	...	... 8 ounces.

boil for half an hour, add opium one drachm, and repeat every three hours if necessary.

(*d.*) During the whole course of the disease nutritive drenches should be frequently administered, oatmeal gruel, rice water, arrowroot and water, "fulka" root with thin rice gruel(2), boossie and water, suttoo and water, or any of these with whey, &c., and when the cow shows any inclination to eat the finest grass, thoroughly cleaned, should be given*

(2) XVI. 2.

* Care must be taken not to allow the animal to satisfy its urgent thirst too copiously, otherwise death is accelerated

Mr. Grote, the President of the Agricultural and Horticultural Society, writes :—The result of my observations this year was to expect recovery if the patient could be supported with liquid food during the crisis of this disease—" Gootee."(1)

(1) XIII.

The complications of the disease are treated on general principles, always keeping in mind the serious and depressing nature of the main disease, and dealing more largely in stimulants than in the simple disease.

1*st*.—There is always more or less bronchitis which, according as it is limited to the windpipe or extends into its sub-divisions, is a less or more severe event. The most important remedial agent is counter-irritation or vesication along the windpipe; this can be best produced by one of the following :—

Oil of turpentine	...	...	...	} Equal parts.
Liquor ammonia	...	...	...	
Olive oil	...	...	...	

To be rubbed in along the course of the trachœa.

Croton seeds	...	...	...	... 1 ounce.
Oil of turpentine	...	...	...	... 12 ounces.

Steep for a fortnight and then pour off the clear liquor. It can be used similarly to the last dose, or diluted with half the quantity of olive oil.(2) If the inflammation extend to the lungs, those applications should be rubbed freely over the chest.

(2) XXX. p. 9

At the same time the following may be given—

Sweet spirits of nitre	...	...	...	4 ounces.
Powered opium	...	...	...	2 drachms.
Powder of ipecacuanha	...	...	...	1 drachm.

one ounce to be given for a dose twice a day in warm gruel.

If the lung disease assume the form of Pneumonia then counter-irritation over the site of pain and abnormal physical signs should be decidedly employed. The best agent for that purpose is the last of the two formulæ above given, with a proportion of 1 part of croton seeds to 8 of turpentine instead of 1 to 12.

2. Ulcers will be treated on the same principles as in Khorah. Scrupulous cleanliness, exclusion of flies, and if they present symptoms of weakness or delayed healing, solution of sulphate of zinc, sulphate of copper, &c., are the main points.

3. The state of " Fardel bound" is best met by the judicious employment of purgatives at the commencement of the disease. If it is indicated later in the disease, the purgative, and especially an oily one, administered as directed should be repeated.

4. Tympanitis is treated, if slight, by an oily purge, linseed or castor oil, followed by strong carminatives, such as carraway, assafœtida, ginger, &c., with opium or bhang and ammonia. A good remedy is ½ of a pound of mustard given in a quart of warm water.

If the case is severe, tapping the stomach or the introduction of a tube into it by mouth should be at once resorted to.

During convalescence, particular care should be given to the diet, which must be nutritious and digestible, at the same time a surfeit must be carefully guarded against.

Tonics as sulphate of iron (2 to 4 drachms) and gentian or cherretta should be given occasionally.

Puschima.—After having gone into such detail into the treatment of Gootee, little remains to be added as to the treatment of Puschima, which must be based on the same system. The more depressing nature and rapid course of the disease should be borne in mind, and nutrients and stimulants are more clearly indicated. These with counter-irritants to the right side, chest, throat, and spine constitute the essence of the treatment.

Oil of turpentine	...	...	...	... 6 ounces.
Croton oil	...	...	...	... 1 „
Liquor of ammonia	...	...	...	... 1 „

is a quick and effective counter-irritant.

If the throat symptoms are severe, counter-irritation should be especially applied all round the larynx, and a solution of nitrate of silver (1 scruple to an ounce) should be applied to the root of the tongue and fauces.

In the third stage camphor should be used largely with a small assafœtida, and capsicum.

Chlorate of potash and common salt might be dissolved in the drenches as antiseptics.

In this as in the last disease the great object of all treatment must be—

First, to support the animal's strength in order to enable it to pass through t stages of the disease; and *secondly*, to meet special symptoms or complications threaten to cut life short during its progress.

NOTE.

SINCE completing the above, I have been fortunate enough to obtain the elaborat excellent Report of the Royal Commission appointed to investigate the cattle plague in Eng I might with advantage introduce many of the interesting observations on this disease r by such men as Drs. Sanderson, Murchison, Marcet, Beale, &c., at the instance of t commission, into the text; but I think it better to let it stand as an independent record of t disease, as observed in India, drawn entirely from Indian source of information. At the same time it will be valuable for purposes of comparison to cite shortly, under the principal heads, some of the conclusions arrived at by the painstaking inquiry of the commission.

Symptoms and pathology of the disease.—Under this head I shall give Dr. Murchison's summary.

"1. The cattle plague now (2nd January 1866) prevalent in Britain is the same disease as the *rinderpest* of German writers.

2. The chief symptoms of the disease are, fever with general depression, an aphthous condition of the interior of the mouth and nostrils, an eruption composed of roseolar patches scabs, and sometimes pustules and petechiæ on the skin, running from the eyes, nostrils and mouth, suppression of milk, constipation followed by diarrhœa, albuminuria and hœmaturia (bloody urine), and the ultimate development of a condition similar to the "typhoid state" of human maladies.

3. The chief morbid conditions found after death are the eruptions on the skin, and in the interior of the mouth catarrhal or croupal inflammation, and even gangrene, of the mucous membranes, ecchymoses, an unusually dark colour of the blood, a peculiar odour, and great proneness to decomposition.

4. There is no resemblance whatever between cattle plague and the typhoid or enteric fever of man in their anatomical lesions, their clinical history, or their etiology. All arguments derived from the supposed identity of these two maladies are therefore baseless.

5. Cattle plague is equally distinct from human typhus, scarlet fever, erysipelas, influenza, or dysentery.

6. Cattle plague belongs unquestionably to the same class of diseases as the human exanthemata, such as variola, scarlatina, and rubeola.

7. Small-pox is the human malady which it most closely resembles; this resemblance hold good, not merely, to a great extent, in the cutaneous eruptions of the two diseases, but in their symptoms and anatomical lesions, and in their extreme contagiousness, and capability of propagation by inoculation.

8 The resemblance between rinderpest and variola is sufficiently striking to demand immediate inquiry, whether vaccination or an attack of ordinary cow-pox confers future immunity from rinderpest, or modifies its course. The result of such an experimental inquiry can alone determine the identity or non-identity of the two diseases; but if the reply to the inquiry be in the affirmative, a certain method of arresting the spread of the cattle plague will be placed in our hands."

A supplement to this summary adds, "the obvious inference" from some experiments "is that, notwithstanding the close analogies between the cattle plague and human small-pox, the former disease like the so-called small-pox of sheep is uninfluenced by ordinary vaccinia, and like it therefore, is in all probability a distinct species of disease from human small-pox." (Third Report, Appendix, p. 79.)

The foregoing is extremely interesting as showing—

1. That the cattle plague of England resembles our "gootee" even more closely than it does "puschima." This is still more clearly brought out by the detailed report in which the analogy (identity?) is pointedly discussed.

2. That the analogies between this and human diseases pointed out at p. p. 23, 24, and 25 of the text are amply confirmed; more particularly the non-identity of cattle plague and typhoid fever, and the strong similarity of the former and small-pox. Dr. Murchison says:—"The changes which take place in peyer's patches are obviously the result of the general intense inflammation of the mucous membrane. There are no sub-mucous deposits, and none of the lesions running through definite stages to ulceration which I am familiar with in the typhoid or enteric fever of man." An opinion exactly identical with that which I was led to from a study of the Indian Cattle Plague.

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d that in the descriptions of rinderpest, from which I drew the
in the text, a cutaneous eruption is not described. This must
er superficial examination or accidental ommission; for Dr. Sanderson,
gated the symptoms of cattle disease, not only himself describes an
of thickened patches of epidermis, excoriations, papules, *crusts, pustules*,
quotes a long array of continental pathologists to the same effect. A
hen an essential feature of rinderpest, and its absence exceptional, and
really void of a cutaneous eruption, which I doubt, is in that particular
inderpest,—a remarkable fact quite opposed to the opinion hitherto held on
his country on high authority.
spasmodic phenomena mentioned in the preceding pages, though not specified
hison, are described by numerous authorities.
he swellings of the neck recorded in so many accounts of gootee and puschima
be peculiar to this country, as they are not mentioned by any other authority
have consulted.

Infectiousness.

"We adhere then to the opinion we formerly expressed, that the true mode of preventing the spread of the cattle plague is to treat it as an entirely contagious disease. We believe this expresses the whole truth; but if it be not so, if some other conditions of which we know nothing, favour or restrict its spread, this does not remove our obligation to act on what is ascertained with certainty." (Third Report, p. 8.)

Inoculation and Vaccination.

"The substitution of a mild for a fatal disease, as of cow-pox for human small-pox, has naturally been hoped for in cattle plague. It will be seen in the report of Dr. Sanderson, and appears also from experiments tried at the Royal Veterinary College, that the vaccine virus, whether taken direct from cows, or after passing through the human body, has no effect on cattle plague, and that human small-pox and the virus of the small-pox of sheep (variola ovina) have likewise no influence. The virus of cattle plague, after transmission through the bodies of sheep and goats, returned into the body of an ox, is found to have lost none of its intensity. Repeated transmission of the virus through cattle weakens its power, but in no very sensible degree. At present the vehicle of the poison, whether it be blood, serum or mucous discharge, appears also to influence its action little, if at all, while mere dilution has no effect whatever. In fact, all attempts either to weaken the power of the cattle plague poison, or to find another agent which might make the system of the ox insusceptible to it have entirely failed." (Third Report, p. 9.)

Treatment.

"But, although as respects the value of drugs, the evidence is merely negative; this is not the case as to diet. The information obtained by the Edinburgh Cattle Plague Committee shows that by judicious feeding with soft mashes of digestible food, the proportion of recoveries has been considerably and in some places very largely increased. This is consistent with the pathology of the disease.*** It does not appear that any advantage is to be obtained by giving large quantities of stimulants. * * * We must close this section of our Report with the admission that in this as in other countries no drug has been found which can be recommended as either an antidote or a paliative." (Third Report, p. 14.)